UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

(Pre- Decisional)
ENVIRONMENTAL ASSESSMENT

for the

State Wide
Wildlife Damage Management at Airports in Missouri
Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

1714 Commerce Court
Suite C
Columbia, MO 65202-1280

May 29, 2001

TABLE OF CONTENTS

1.0 Chapter 1: PURPOSE AND NEED FOR ACTION
- 1.1 Introduction
- 1.2 Purpose
- 1.3 Need for Action
  - 1.3.1 Summary of Proposed Action
  - 1.3.2 Objective for the Wildlife Services WDM Program @ MO Airports
  - 1.3.3 Need for Wildlife Damage Management to Protect Property
  - 1.3.4 Need for Wildlife Damage Management to Protect Human Health and Safety
- 1.4 Current and Projected Work
- 1.5 Relationship of the Environmental Assessment to other Environmental Documents
- 1.6 Decision to be made
- 1.7 Scope of the Environmental Assessment Analysis
  - 1.7.1 Actions Analyzed
  - 1.7.2 Period for Which this EA is Valid
  - 1.7.3 Site Specificity
- 1.8 Authority and Compliance
  - 1.8.1 Authority of Federal and State Agencies in Wildlife Damage Management on MO Airports
    - 1.8.1.1 WS Legislative Mandate
    - 1.8.1.2 U.S. Fish and Wildlife Service (USFWS)
    - 1.8.1.3 Missouri Department of Conservation Legislative Mandate
  - 1.8.2 Compliance with other Federal Laws
    - 1.8.2.1 National Environmental Policy Act (NEPA)
    - 1.8.2.2 Endangered Species Act (ESA)
    - 1.8.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711' 40 Stat. 755), as amended
    - 1.8.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
    - 1.8.2.5 National Historic Preservation Act (NHPA) of 1966 as amended
    - 1.8.2.6 Environmental Justice and Executive Order 12898- "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."
    - 1.8.2.7 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)
    - 1.8.2.8 Executive Order 13112 – Invasive Species
  - 1.8.3 Compliance with other State Laws.
    - 1.8.3.1 Owner May Protect Property 3CSR10-4.130
    - 1.8.3.2 Compliance with Airport Policies and Regulations

2.0 Chapter 2- Issues
- 2.1 Affected Environment
- 2.2 Issues
  - 2.2.1 Effects on Target Wildlife Species Populations
  - 2.2.2 Effects on Non-target Species populations, including T&E Species
  - 2.2.3 Economic Losses to Property as a Result of Wildlife Damage
  - 2.2.4 Effects on Human Health and Safety
    - 2.2.4.1 safety and efficacy of chemical control methods
    - 2.2.4.2 Impacts on Human safety of non-chemical WDM methods

2.2.4.3 Impacts on human safety from wildlife strike hazards
2.2.5 Effects on Aesthetics
2.2.5.1 Effects on Human Affectionate-Bond with Individual animals and on Aesthetic Values of Wildlife species
2.2.5.2 Effects on Aesthetic Values of Property Damaged by Birds
2.2.6 Humanness and Animal Welfare Concerns of Lethal Methods Used by WS.

3.0 Chapter 3: Alternative Including the Proposed Action
3.1 Description of the Alternatives
3.1.1 Alternative 1- Continue the Current Federal WDM Program/Integrated Wildlife Damage Management (No Action/Proposed Action)
3.1.2 Alternative 2- Non-lethal WDM Only By WS
3.1.3 Alternative 3- Lethal WDM Only by WS
3.1.4 Alternative 4- No Federal WS WDM
3.2 WDM Strategies and Methodologies Available to WS at MO Airports
3.2.1 Integrated Wildlife Damage Management (IWDM)
3.2.2 Alternative 1 Current Federal WDM Program/Integrated Wildlife Damage Management (No Action/Proposed Action)
3.2.2.1 Technical Assistance Recommendations
3.2.2.2 Direct Damage Management Assistance
3.2.2.3 Examples of WS Operational Technical Assistance in WDM at MO Airports
3.2.3 WS Decision-Making
3.2.4 Wildlife Damage Management Methods
3.2.4.1 Non-chemical, Non-lethal Methods
3.2.4.2 Chemical, Non-lethal Methods
3.2.4.3 Mechanical, Lethal Methods
3.2.4.4 Chemical, Lethal Methods
3.2.5 Alternative 2 – Non- lethal WDM Only by WS
3.2.6 Alternative 3- Lethal WDM Only by WS
3.2.7 Alternative 4- No Federal WS Wildlife Damage Management
3.3 Alternatives Considered But Not Analyzed in Detail with Rationale
3.3.1 Technical Assistance Only
3.4 Mitigation and Standard Operation Procedures for Wildlife Damage Management Techniques
3.4.1 Mitigation in Standard Operation Procedures (SOP)
4.0 Chapter 4: Environmental Consequences
4.1 Environmental Consequences for Issues Analyzed in Detail
4.1.1 Effects on Target Species Wildlife Populations
4.1.1.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The Proposed Action as described in Chapter 1)
4.1.1.2 Alternative 2 – Non-lethal WDM Only by WS
4.1.1.3 Alternative 3- Lethal WDM Only by WS
4.1.1.4 Alternative 4 –No Federal WS WDM
4.1.2 Effects on Non-target Species Populations, including Threatened and Endangered Species.
4.1.2.1 Alternative 1- Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.2.2 Alternative 2- Non-lethal WDM Only by WS
4.1.2.3 Alternative 3- Lethal WDM Only by WS
4.1.2.4 Alternative 4 – No Federal WS WDM
4.1.3 Economic Losses to Property as a Result of Wildlife Damage
4.1.3.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.3.2 Alternative 2- Non-lethal WDM Only by WS
4.1.3.3 Alternative 3- Lethal WDM Only by WS
4.1.3.4 Alternative 4- No Federal WS WDM
4.1.4 Effects on Human Health and Safety

4.1.4.1 Impacts of chemical WDM methods on human health
4.1.4.1.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.4.1.2 Alternative 2- Non-lethal WDM Only by WS
4.1.4.1.3 Alternative 3- Lethal WDM Only by WS
4.1.4.1.4 Alternative 4- No Federal WS WDM
4.1.4.2 Impacts on human safety of non-chemical methods
4.1.4.2.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.4.2.2 Alternative 2- Non-lethal WDM Only by WS
4.1.4.2.3 Alternative 3- Lethal WDM Only by WS
4.1.4.2.4 Alternative 4- No Federal WS WDM
4.1.4.3 Impacts on human safety from wildlife strike hazards to aircraft
4.1.4.3.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.4.3.2 Alternative 2- Non-lethal WDM Only by WS
4.1.4.3.3 Alternative 3- Lethal WDM Only by WS
4.1.4.3.4 Alternative 4- No Federal WS WDM
4.1.5 Effects on Aesthetics
4.1.5.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species
4.1.5.1.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.5.1.2 Alternative 2- Non-lethal WDM Only by WS
4.1.5.1.3 Alternative 3- Lethal WDM Only by WS
4.1.5.1.4 Alternative 4- No Federal WS WDM
4.1.5.2 Effects on Aesthetic Values of Property Damage by Birds
4.1.5.2.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.5.2.2 Alternative 2- Non-lethal WDM Only by WS
4.1.5.2.3 Alternative 3- Lethal WDM Only by WS
4.1.5.2.4 Alternative 4- No Federal WS WDM
4.1.6 Humanness and Welfare Concerns of Lethal Methods Used By WS
4.1.6.1 Alternative 1 – Continue the Current Federal Wildlife Damage Management Program (The No Action/ Proposed Action)
4.1.6.2 Alternative 2- Non-lethal WDM Only by WS
4.1.6.3 Alternative 3- Lethal WDM Only by WS
4.1.6.4 Alternative 4- No Federal WS WDM
4.2 Cumulative Impacts

1.0 CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 Introduction

The United States Department of Agriculture (USDA) is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services (WS) program is the Animal Damage Control Act of March 2, 1931, as amended (7 U.S. C. 426-426c; 46 Stat. 1468) and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (P.L. 100-202). WS activities are conducted in cooperation with other federal, state and local agencies; and private organizations and individuals. Federal agencies, including the United States Department of Interior, Fish and Wildlife Service, recognize the expertise of WS to address wildlife damage issues related to migratory birds.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (Leopold 1933, the Wildlife Society 1990, Berryman 1991). The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of The Animal Damage Control Program Final Environmental Impact Statement (U.S. Dept. Agri. 1997). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that populations of the offending species are reduced through lethal methods.

WS's mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

A) Training of wildlife damage management professionals;
B) Development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
C) Collection, evaluation, and dissemination of management information;
D) Cooperative wildlife damage management programs;
E) Informing and educating the public on how to reduce wildlife damage and;
F) Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with wildlife at airports in the State of Missouri.

WS is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, WS and the land owner/administrator must complete Agreements for Control or WS Work Plans. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

Individual actions on the types of sites encompassed by this analysis may be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). WS has decided to prepare this EA to assist in planning wildlife damage management (WDM) activities and to clearly communicate with the public the analysis of cumulative impacts for a number of issues of concern in relation to alternative means of meeting needs for such management at civil and military airports. This analysis covers WS's plans for current and future WDM actions wherever they might be requested on civil and military airports.
This environmental assessment (EA) documents the analysis of the potential environmental effects of the proposed program. This analysis relies mainly on existing data contained in published documents, primarily the Animal Damage Control Final Environmental Impact Statement (U.S. Dept. Agri. 1997) to which this EA is tiered. These WS activities will be undertaken in compliance with relevant laws, regulations, policies, orders, and procedures including the Endangered Species Act.

A Notice of Availability of the draft environmental assessment (pre-decisional) was published consistent with APHIS NEPA procedures to allow interested parties the opportunity to obtain and review the document and comment on the proposed management activities.

1.2 Purpose

The purpose of this EA is to analyze the effects of WS activities on Missouri airports to manage damage caused by the mammal and avian wildlife species. Mammals may include, but are not necessarily limited to the following. White-tailed deer (*Odocoileus virginianus*), Coyotes (*Canis latrans*), *Raccoons (Procyon lotor*), Opossums (*Didelphis virginianus*), Red Fox (*Vulpes fulva*), Gray Fox (*Urocyon cinereoargenteus*), Bobcat (*Lynx rufus*), Feral cats (*Felix sp*.), Badger (*Taxidea taxus*), Beaver (*Castor* canadensis), Muskrat (*Ondatra zibethica*), and Woodchuck (*Mormota monax*).

Avian bird species may include, but are not necessarily limited to the following. Red winged black birds (*Agelaius phoeniceus)*, European starlings *(Sturnus vugaris*), Brown headed cowbirds (*Molothrus ater*), Easterm Meadow Larks (*Sturnella magna)*, Horned larks (*Eremophila alpestris)*, Killdeer (*Charadrius vociferus)*, Canada Geese (*Branta canadensis)*, Snow Geese (*Chen caerulescens)*, Mallards (*Anas platyrhynchos*), Other Ducks (Anatinae), Terns (Sterninae), Gulls (Larinae), Short-eared Owl (*Asio flammu\eus*), Great Horned Owl (*Bubo virginianus*), Barred Owl (*Strix varia*), Red-tailed Hawk (*Buteo jamaicensis*), Rough-Legged Hawk (*Bueto lagopus*), American Kestrel (*Falco sparverius*) , Swansion's Hawk (*Buteo swainsoni*) , Northern Harrier (*Circus cyaneus*), Wild Turkey (Meleagris gallopavo), Mourning dove (*Zenaida macroura*), Rock dove (*Columba livia),* purple finch (Barn swallow (*Hirundo rustica*), Cliff swallow (*Petrochelidon pyrrhonota*), American crow (*Corvus brachyrhnchos*), Turkey vultures (*Cathartes aura*) common grackles (*Quiscalus quiscula*), Blue Jay (*Cyabicutta crustata*), eastern bluebird (*Sialia sialis*), Northern Cardinal (*Cardinalis cardinalis*), Upland sandpiper *(Bartramia longicaude*), Pheasant (*Phasianus colchicus)*, and Common snipe (*Capella gallinago*).

Resources protected by such activities include property, and human health and safety.

1.3 Need For Action

1.3.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program at Missouri civil and military airports that responds to requests for WDM to protect property, and human health and safety at airports. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet request or needs for resolving conflicts with wildlife affecting the use of the airfield and airports operations (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS would include shooting, trapping, DRC-1339 (Starlicide, Avitrol), or euthanasia following live capture by trapping. Non-lethal methods used and recommended by WS may include habitat alteration, chemical repellents (e.g., methyl anthranilate), wire barriers and deterrents, netting, and harassment and scaring devices. The implementation of non-lethal methods such as habitat alteration and exclusion-type barriers would be the responsibility of the airport to implement. WDM by WS would be allowed at airports, when requested, where a need has been documented and upon completion of an Agreement for Control. All management actions would comply with appropriate federal, state, and local laws.

1.3.2 Objective for the Wildlife Services WDM Program at Missouri Airports

The pupose of the proposed action is to minimize the threat to human health and safety and damage to aircraft.

Specific objectives:

* To reduce damaging wildlife strikes to less than 5 strikes per year per airport
* Reduce and maintain wildlife use in hangers to less than $1000 dollars in damage per year.
* To maintain the runways and airfields to no down time caused by wildlife

1.3.3 Need for Wildlife Damage Management to Protect Property

Since 1990, 19 Missouri Civil airports recorded more that 500 wildlife strikes, of these 209 had identifiable remains. These Missouri airports experienced strikes from gulls (6.2%), white-tailed deer *Odocoilous virginiaous* (6.2%), Coyotes *Canis latarans* (1.4%), other mammals (1.0%), raptors (12.9%) waterfowl (26.3%) and other birds (45.9%) that include blackbirds, starlings, pigeons, killdeer and doves. This number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Bird Strike Committee USA 2000). During 1993 to 2000 the Air Force Units stationed in Missouri report in excess of 375 wildlife strikes with many of the species being the same struck at civil airfields. (WAFB Flight Safety 2000).

1.3.3.1 Need for Bird Damage Management to Protect Property

Birds are a continuous threat to aircraft for the simple fact that they are highly mobile and often prefer the habitat created by an airfield. With this in mind and following the basic laws of physics that no two items can occupy the same space at the same time, a pro-active management should be taken in order to reduce these threats. A prime example where pro-active management would have saved lives was in September 1995, an USAF AWAC aircraft crashed immediately after take-off at Elmendorf Air Force Base, Alaska, killing all 24 personnel on board. The plane struck a flock of Canada geese that had been seen on a field adjacent to the airfield by a controller, unfortunately the E-3 crew or the Airfield management was not notified. In Missouri since 1990 there have been over 500 reported air strikes, with at least two being classified as significant. On 31 March 1996 at KMCI a B-737 struck a medium to large bird on take off. Airport operations found a piece of inlet cooling duck on the runway, the aircraft returned and landed safely. The engine had several damaged guide vanes and resulted in the aircraft being out of service for about 24 hours. (FAA, Wright 2000). On 4 March 1999 at KMCI a DC-9 on approach stuck a flock of snow geese. Geese were ingested in both engines. One engine shut down and the other was severely damaged but continued working. The aircraft landed without incident and is currently being investigated by the NTSB. (FAA, Wright 2000) During CY 2000 Missouri air ports reported more than 1 million dollars in damage to aircraft from bird strikes.

Birds occasionally damage structures on private property or public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on aircraft and automobiles parked at terminals, can occur because of uric acid from bird droppings. Pigeons, starlings and house sparrows sometimes cause structural damage to the inside of hangers and buildings. These birds often roost or nest in the rafters of the buildings where they damage the insulation, and wiring. Also, birds build their nest in engines and other compartments of parked aircraft.

1.3.3.2 Need for Mammal Damage Management to Protect Property

Mammals also pose a serious threat to aircraft. Animals such as deer, coyotes, skunks and raccoons often venture onto airfields and become a direct threat to planes both landing and taking off. The risk that wildlife pose to aircraft is well documented with over 430 civil aircraft collisions with deer reported in the U.S., 1990 to 1999 (Bird Strike Committee USA 2000). In the same time from Missouri airfields 13 deer/civil aircraft collisions were reported, as well as, 4 coyotes, 1 fox and 1 unidentified mammal. These strikes resulted in 1 aircraft destroyed, 6 with substantial damage, 5 with minor damage, 3 with no damage and 4 with no damage report submitted (FAA, Wright 2000).

Since 1985 the USAF has record more that 190 strikes that involved aircraft and mammals. These strikes resulted in more than $496,000 in damage. Of these strikes deer are the most costly to aircraft, with the most recent occurring at Laughlin AFB in March of 2000. A T-38 Talon hit a deer on landing and caused damage to the left main landing gear. Also at Little Rock AFB, between 1993 and 1998 three deer strikes were recorded, two in 98'. These strikes averaged over $4600 per strike. MO airports has also had their share of mammal strikes with the most costly strike involved a B-2 Stealth Bomber striking a coyote on landing. The strike caused damage to the front landing gear and breaks. While at MO airports WS has been working to reduce threats though technical assistance and direct control. Such activities include the recommendation to modify habitat, construction of a wildlife fence and use of harassment techniques.

1.3.4 Need for Wildlife Damage Management to Protect Human Health and Safety

Wildlife often pose risks to human health and safety when their populations reach relatively high numbers or then concentrate in a localized area. These risks include but are not limited to items such as transmission of diseases, injury or death to persons involved in wildlife/aircraft strikes and injury from aggressive behavior of wildlife.

1.3.4.1 **Mammal Damage Management to Protect Human Health and Safety**

WS is often contacted and asked to solve problems involving mammals damage issues in relation to human safety. At Missouri Airports there is the continuing risk of a mammal/aircraft strike which could result in the injury or death of the aircrew, passengers or personnel on the ground. WS has also been asked to resolve such problems as the removal of mammals from buildings and other areas where human activity his normal. Examples include the relocation of skunks from hangers and around buildings. Deer that have wondered into areas such are terminals and fenced areas the airfield. Deer/car collisions have occurred on airport properties causing damage to personal property as well as injuries. Coyotes threatening security K-9 patrol teams and others. Another issue of concern that WS has been addressed with is wild mammal's carrying/transmitting rabies

1.3.4.2 **Bird Damage Management to Protect Human Health and Safety**

Bird/aircraft strikes are a common hazard when birds occupy the same space as aircraft. The risk of injury is great in these incidents and the loss of life has happened many times. At MO airports, these threats come in many shapes and sizes. Resident Canada geese often use airfields for loafing, feeding and nesting areas. One airfield has also had a sever problem with blackbirds (red-winged blackbirds, European starlings, grackles, etc.) which have established a roost on or near the airfield. This roost has been estimated to exceed 250,000 birds. These large flocks of birds pose such risks to aircraft and the health and safety of pilots that there have been restrictions on the hours that flying is allowed. In addition to the threats to aircrews, MO airports has requested assistance with feral domestic pigeon or nuisance blackbird or starling roost problems in relation to potential disease risks and the mess associated with droppings left by concentrations of birds is aesthetically displeasing and results in continual clean-up costs.

Feral domestic pigeons and starlings have been suspected in the transmission of 29 different diseases to humans, (Rid-A-Bird 1978, Weber 1979, and Davis et.al. 1971). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, paratyphoid, Pasteurellosis, and Listeriosis; mycotic (fungal) diseases such as aspergillosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozoal diseases such as American trypansomiasis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, starlings, and English sparrows (Weber 1979). Table 1-1 shows the more typical diseases affecting humans that can be transmitted by pigeons, sparrows and starlings.

Table 1-1. Information on some diseases transmittable to humans that are associated with feral domestic pigeons, starlings, and English sparrows. Information taken from Weber (1979).

Disease	Human Symptoms	Potential for Human Fatality
Bacterial:		
erysipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly to young children, old or infirm people
salmonellosis	gastroenteritis, septicaemia, persistent infection	possible, especially in individuals weakened by other disease or old age
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	rarely
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	sometimes - particularly with newborns
Viral:		
meningitis	inflammation of membranes covering the brain , dizziness, and nervous movements	possible — can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis
encephalitis (7 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%
Mycotic (fungal):		
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	not usually
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	rarely
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis
histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow
Protozoal:		
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks
toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	possible
Rickettsial/Chlamydial:		

chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases
Q fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible

1.4 CURRENT AND PROJECTED WORK

WS is currently working at several airports with the state of Missouri. At these airports WS has implemented different methods to reduce wildlife hazards. One airport currently employs the services of two full time WS employees to provide direct control and technical assistance. Other airports have contracted with WS to provide direct control and technical assistance on a part time basis, while others receive direct control only. Projected work at Missouri airports include conducting Wildlife Hazard Assessments, developing Wildlife Hazard Management Plans, and providing technical assistance as well as direct control. Examples of different work that has been done are: recommendations to modify habitat through grazing programs, converting airfields to a monoculture of fescue, constructing wildlife fences, as well as conducting direct control. Direct control at these airports include but are not limited to harassment, capture and relocation programs, and lethal removal.

1.5 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

WS has issued a Final Environmental Impact Statement on the national APHIS/WS program (USDA 1997). This EA is tiered to the Final EIS. Pertinent information available in the FEIS has been incorporated by reference into this EA.

1.6 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should WDM as currently implemented by the WS program be continued at airports in Missouri?
- If not, should WS attempt to implement one of the alternatives to an IWDM strategy as described in the EA?
- Might the continuing of WS's current program of WDM have significant impacts requiring preparation of an EIS?

1.7 Scope Of This Environmental Assessment Analysis

1.7.1 Actions Analyzed This EA evaluates wildlife damage management by WS to protect property, and human health and safety at Missouri airports wherever such management is requested from the WS program.

1.7.2 Period for Which this EA is Valid This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WDM activities at civil and military airports in Missouri.

1.7.3 Site Specificity. This EA analyzes potential impacts of WS's WDM activities that will occur or could occur at civil and military airports in Missouri. This EA analyzes the potential impacts of such efforts wherever and whenever they might occur as part of the current program. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of wildlife damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS at Missouri airports (See USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.8 AUTHORITY AND COMPLIANCE

1.8.1 Authority of Federal and State Agencies in Wildlife Damage Management at Missouri Airports

1.8.1.1 WS Legislative Authority

The primary statutory authority for the WS program is the Animal Damage Control Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), which provides that:

> The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "bringing (damage) under control," rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

> "That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

1.8.1.2 U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the Migratory Bird Treaty Act and those that are listed as threatened or endangered under the Endangered Species Act. Sections 1.7.2.2 and 1.7.2.3 below describe WS's interactions with the USFWS under these two laws.

1.8.1.3 Missouri Department of Conservation Legislative Authority

The Missouri Department of Conservation (MDC), under the direction of the Conservation Commission, is specifically charged by the General Assembly with the management of the state's wildlife resources. Although many legal mandates of the Conservation Commission and the Department are expressed throughout the Wildlife Code of Missouri, the primary statutory authorities include wildlife management responsibilities, public education charges, law enforcement authorities, and regulatory powers. Also, MDC has the statutory authority to manage damage to agriculture and property, and to protect human health and safety from damage involving mammals.

1.8.2 COMPLIANCE WITH OTHER FEDERAL LAWS

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.8.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action at Missouri Airports. When WS operational assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency. However, WS may agree to complete NEPA documentation at the request of the other federal agency.

1.8.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available" (Sec.7(a)(2)). WS obtained a Biological Opinion (B.O.) from USFWS in 1992 describing potential effects on T & E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F).

1.8.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended.

The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "take" of these species, except as permitted by the USFWS; therefore the USFWS issues permits for reducing bird damage. WS will obtain MBTA permits covering WDM activities that involve the taking of species for which such permits are required in accordance with the MBTA and USFWS regulations, or will operate as a named agent on MBTA permits obtained by cooperators. WS is also authorization by the MDC covering the intential take migratory birds for damage management purposes from the MDC Wildlife Code which regulates take of migratory birds protected by state law.

1.8.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used or recommended by the WS program at Missouri airports are registered with and

regulated by the EPA and MO and are used by WS in compliance with labeling procedures and requirements.

1.8.2.5 National Historic Preservation Act (NHPA) of 1966 as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. WS activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. WS has determined WDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties.

1.8.2.6 Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. It is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

1.8.2.7 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).
Children may suffer disproportionately from environmental health and safety risks for many reasons. Wildlifedamage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

1.8.2.8 Executive Order 13112 - Invasive Species
Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

1.8.2.3 Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its supplementing regulations (29CFR1910) on sanitation standards states that "Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected." This standard includes birds that may cause safety and health concerns at workplaces.

1.8.3 COMPLIANCE WITH OTHER STATE LAWS.

1.8.3.1 Owner May Protect Property 3CSR10-4.130

This regulation authorizes landowners or agents of the landowner to protect property, subject to federal regulations from migratory birds, any wildlife except deer, turkey, bear and any endangered species which beyond reasonable doubt is damaging property may be capture or killed at any time with out a permit. Deer, turkey, black bears and endangered species that are causing damage maybe killed only with the permission of an agent of the department, and by methods authorized by the agent.

1.8.3.2 Federal Aviation Administration (FAA) Regulations concerning BASH

The FAA is enpowered to issue airport operation certificates to airports serving air carriers, and to establish minimum safety standards for the operation of airports. Some of these regulations and polices directly involved the management of wildlife and wildlife hazards on and/or near airports. Under the Federal Aviation Regulations (FAR) 139.337 Wildlife Hazard Management, an airport is required to conduct a Wildlife Hazards Assessment and a Wildlife Management Plan when specific wildlife event(s) occur. Under the FAA/ADC Memorandum of Understanding (MOU), the WS programs supports all of the requirements contained in FAR 139.337. FAA Certalert No. 97-02 further clarifies the roles of, and relationships between, the FAA and WS with regards to wildlife hazards on or near airports. (USDA Managing Wildlife Hazards at Airports July 1998).

2.0 CHAPTER 2 - ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional description of affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

2.1 Affected Environment

Missouri is located in mid west with two major cities on the eastern and western borders. The state is made up of several ecological regions the include but are not limited to the Mississippi River Valley, the Ozarks, rolling hills and prairies. These ecosystems are home to a wide variety of wildlife and habitat. The state is also home to many airports and air bases; which include two major airports, several Air Force Reserve Units, an Air Force Bomber Base and countless private air fields. These airports and air bases occupy more than 18,000 acres, which include grasslands, timber, runways, taxiways, recreational areas, office buildings and water impoundment's.

.

2.2 Issues. The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on Target Wildlife Species Populations
- Effects on Other Wildlife Species Populations, including T&E Species
- Effects of Damage to Property from Wildlife Strikes
- Effects on Human Health and Safety
- Effects on Aesthetics
- Humanness and Animal Welfare Concerns of Lethal Methods Used by WS

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

2.2.1 Effects on Target Wildlife Species Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA are the mammal and bird species listed in section 1.2. A minimal number of individuals are likely be killed by WS's use of lethal control methods under the proposed action in any one year. Individual numbers of bird and mammal species take by WS in CY 97-00 are list in tables 4-1 and 4-2, respectively.

2.2.2 Effects on Non-target Species populations, including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage control methods and activities on non-target species, particularly Threatened and Endangered Species. WS's standard operating procedures include measures intended to mitigate or reduce the effects on non-target species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed.

2.2.3 Economic Losses to Property as a Result of Wildlife Damage

A major concern by the aviation industry is the economic impact of wildlife damage to aircraft and other airport property. These people are concerned as to whether the proposed action or any of the alternatives would reduce such damage to more acceptable levels. Wildlife has and could cause damage to aircraft and property as describe in the need for action.

2.2.4 Effects on Human Health and Safety

2.2.4.1 Safety and efficacy of chemical control methods

Some individuals may have concerns that chemical used for bird control should not be used because of potential adverse effects on people from being exposed to the chemicals directly or to birds that have died as a result of the chemical use. Under the alternatives proposed in this EA, the primary toxicant proposed for use by WS is DRC-1339 (Starlicide), which would be primarily used to remove feral domestic pigeons and starlings or blackbirds in damage situations. The EPA through FIFRA regulates DRC-1339 use, by Missouri Pesticide Control Laws, and by WS Directives. The chemical bird repellent Flight control could be used to reduce feeding activity on the airfield. Flight Control is a Bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area. Another chemical method that could be used is Avitrol, which is classified as an avian distressing agent and is normally used to avert certain bird species from using certain problem areas. Other chemicals available for use include the tranquilizer Alpha-Chloralose (for live-capturing nuisance waterfowl and pigeons) and methyl anthranilate (artificial grape flavoring, which also has bird repellent capabilities).

2.2.4.2 Impacts on human safety of non-chemical WDM methods

Some people may be concerned that WS's use of firearms, traps, snare, and pyrotechnic scaring devices could cause injuries to people. WS personnel occasionally use traps, snares, rifles and shotguns to remove wildlife that are causing damage. There is some potential fire hazard to airport property from pyrotechnic use.

2.2.4.3 Impacts on human safety from wildlife strike hazards

The concern stated here is that the absence of adequate WDM would result in adverse effects on human health and safety, because bird and mammal strikes on aircraft would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries or loss of human lives from wildlife strikes to aircraft.

2.2.5 Effects on Aesthetics

2.2.5.1 Effects on Human Affectionate-Bonds with Individual animals and on Aesthetic Values of Wildlife Species

Some individual members or groups of wildlife species habituate and learn to live in close proximity to humans. Some people in these situations feed such birds/mammals and/or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. In addition, some people consider individual wild animals as "pets," or exhibit affection toward these animals. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or birdhouses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

Public reaction to damage management actions is variable because individual members of the public can have widely different attitudes toward wildlife. Some individuals that are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

The public's ability to view wildlife in a particular area would be more limited if the birds and mammals are removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a damage management action. In addition, the opportunity to view or feed other wildlife would be available if an individual makes the effort to visit local wildlife management areas and other sites with adequate habitat and local populations of the species of interest.

Some people do not believe that individual animals or nuisance bird roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view birds and other wildlife species are lessened by WS non-lethal harassment efforts.

2.2.5.2 Effects on Aesthetic Values of Property Damaged by Birds

Airport personnel have expressed concerns of bird roosting in trees and structures on airport property and are generally concerned about the negative aesthetic appearance of bird droppings. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns where birds are roosting, or visitors irritated by the odor of or of having to walk on fecal droppings.

2.2.6 Humanness and Animal Welfare Concerns of Lethal Methods Used by WS.

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if " . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."

Suffering is described as a " . . . highly unpleasant emotional response usually associated with pain and distress." However, suffering " . . . can occur without pain . . ." and " . . . pain can occur without suffering . . . " (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for " . . . little or no suffering where death comes immediately . . . " (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would " . . . probably be causes for pain in other animals . . . " (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991).
Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since " . . . neither medical or veterinary curricula explicitly address suffering or its relief" (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are

found practical, a certain amount of animal suffering could occur when some WDM methods are used in situations where non-lethal damage management methods are not practical or effective.

MO WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/Standard Operating Procedures (SOP) used to maximize humaneness are listed in Chapter 3.

3.0 CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

Alternatives analyzed in detail are:

1) Alternative 1 - Continue the Current Federal WDM Program. This is the Proposed Action as described in Chapter 1 and is the "No Action" alternative as defined by the Council on Environmental Quality for analysis of ongoing programs or activities.

2) Alternative 2 - Non-lethal WDM only by WS

3) Alternative 3 - Lethal WDM only by WS

4) Alternative 4 - No Federal WS WDM. This alternative consists of no federal WDM program by WS.

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1 - Continue the Current Federal WDM Program /Integrated Wildlife Damage Management (No Action/Proposed Action).

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with the Council on Environmental Quality's (CEQ's) definition (CEQ 1981).

The proposed action is to continue the current portion of the WS program that responds to requests for WDM to protect property, and human health and safety at Missouri's civil and military airports. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet request or needs for resolving conflicts with wildlife affecting the use of the airfield and base operations (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS would include shooting, trapping, DRC-1339 (Starlicide, Avitrol), or euthanasia following live captures by trapping. Non-lethal methods used by WS may include habitat alteration, chemical repellents (e.g., methyl anthranilate), wire barriers and deterrents, netting, and harassment and scaring devices. In many situations, the implementation of non-lethal methods such as habitat alteration and exclusion-type barriers would be the responsibility of the airport to implement. WDM by WS would be allowed on airports, when requested, where a need has been documented and upon completion of an Agreement for Control. All management actions would comply with appropriate federal, state, and local laws.

3.1.2 Alternative 2 - Non-lethal WDM Only By WS.

This alternative would require WS to use and recommend non-lethal methods only to resolve wildlife damage problems. Persons receiving technical assistance could still resort to lethal methods that were available to them. Currently, DRC-1339 and Alpha-Chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals would be illegal. Under this alternative, Alpha-Chloralose would be used by WS personnel to capture and relocate wildlife. Appendix B that describes a number of non-lethal methods available for use by WS under this alternative.

3.1.3 Alternative 3 - Lethal WDM Only By WS.

Under this alternative, WS would provide only lethal direct control services and technical assistance. Technical assistance would include making recommendations to the FWS and MDC regarding the issuance

of permits to resource owners to allow them to take wildlife by lethal methods. Requests for information regarding non-lethal management approaches would be referred to MDC, FWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary. Not all of the methods listed in Appendix B are available to other agencies or private individuals.

3.1.4 Alternative 4 - No Federal WS WDM.

This alternative would eliminate Federal involvement in WDM at Missouri airports. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own WDM without WS input. DRC-1339 and Alpha-Chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals would be illegal. Avitrol could be used by State certified restricted-use pesticide applicators.

3.2 WDM STRATEGIES AND METHODOLOGIES AVAILABLE TO WS at MO AIRPORTS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2, and 3 described above. Alternative 4 would terminate both WS technical assistance and operational WDM by WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM).

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[1] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., restricting flying times), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 Alternative 1 Current Federal WDM Program/Integrated Wildlife Damage Management (No Action/Proposed Action).

3.2.2.1 Technical Assistance Recommendations.

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application.

[1] The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns

Under APHIS NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

3.2.2.2 Direct Damage Management Assistance.

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when Agreements for Control or other comparable instruments provide for WS direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex.

3.2.2.3 Examples of WS Direct Operational and Technical Assistance in WDM at Missouri airports.

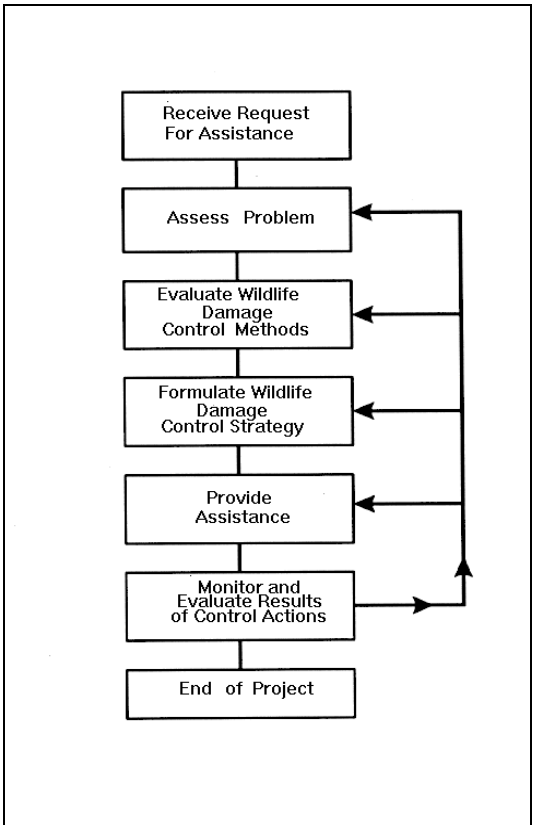
While working at Missouri airports, WS has implemented and conducted many projects that provide both Direct Damage Management and Technical Assistance (TA). Such projects include but are not limited to the problems of white-tailed deer (Odocoileus virginianus) on the airfields and runway; red-winged blackbirds (*Agelaius phoeniceus)* roosting on airport property causing the closure of the airfield; and raptors (birds of prey) using airfields.

For the white-tailed deer problem, WS provided technical assistance by making such suggestions as modifying the habitat and the construction a wildlife fence around the airfield. WS also monitors and tracks the population using spotlight counts. Direct control methods employed by WS include harassment using pyrotechnics and lethal removal by sharp shooting. For the red winged black bird roost, TA that WS provided included recommendations of habitat and behavior management, such as removal of cattails through various methods, and harassment using multiple techniques. WS also provided direct control through harassment using propane cannons, pyrotechnics, radio-controlled airplanes and lethal reinforcement by shooting. Finally for the problem of raptors, WS has provided TA by making suggestions of restricting flying when bird watch conditions change from low to moderate or severe; changes in habitat and harassment techniques. Direct control provided by WS includes harassment by distress calls, pyrotechnics, radio controlled aircraft and a capture and relocation program.

3.2.3 WS Decision-Making.

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The

Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.



3.2.4 Wildlife Damage Management Methods Available for Use. (See Appendix B for detailed descriptions of WDM Methodologies)

3.2.4.1 Non-chemical, Non-lethal Methods (See Appendix B for detailed descriptions)

Property owner practices consist primarily of non-lethal preventive methods such as cultural methods[2] and habitat modification.

Animal behavior modification refers to tactics that alter the behavior of wildlife to reduce damages. Some but not all of these tactics include:

- Exclusions such as fencing
- Propane cannons (to scare birds and mammals)
- Pyrotechnics (to scare birds and mammals)
- Distress calls and sound producing devices (to scare birds)
- Visual repellents and scaring tactics

Relocation of damaging birds and mammals as directed by MDC to other areas.

Nest destruction of the target species before eggs or young is in the nest.

Egg addling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; or directly removing eggs from a nest and destroying them.

Habitat/environmental modification to attract or repel certain wildlife species.

Live traps are various types of traps designed to capture birds and mammals alive for relocation or euthanasia. Some examples are, snares, leg-hold traps, cage traps, clover traps, decoy traps, nest box traps, mist nets, etc.

3.2.4.2 Chemical, Non-lethal Methods (See Appendix B for detailed descriptions)

Avitrol is a chemical frightening agent registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. This chemical works by causing distress behavior in the birds that consume treated kernels from a mixture of treated and untreated bait,

[2] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage

which generally frightens the other birds from the site. Generally birds that eat the treated bait will die (Johnson and Glahn 1994).

Alpha-chloralose is used as an immobilizing agent, which is a central nervous system depressant, and used to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well-contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds.

Methyl Anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl. It can be applied to turf or surface water or as a fog to repel birds from small areas. It may also become available for use as a livestock feed additive that has bird repellent value.

Flight Control (anthraquinone) (Avery et al. 1997) The chemical bird repellent Flight control could be used to reduce feeding activity on the airfield. Flight Control is a bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area.

3.2.4.3 Mechanical, Lethal Methods (See Appendix B for detailed descriptions)

Shooting is the practice of selectively removing target species by shooting with an air rifle, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques.

Snap traps are modified rat traps that are used to remove individual birds such as woodpeckers causing damage to buildings.

Body grip (e.g. conibear) traps are kill traps designed to cause the quick death of the animal that activates the trap. The Conibear size 330 traps used for beaver are used exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface. Smaller body grip traps, such as the size 110 used for muskrats, can be set either in or out of the water.

Cervical dislocation is sometimes used to euthanasia birds that are capture in live traps. AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and of small birds (Andrews et al. 1993)

3.2.4.4 Chemical, Lethal Methods (See Appendix B for detailed descriptions)

DRC-1339 is a slow acting aviancide for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for feral domestic pigeon, starling, and blackbird damage management under the current program.

Carbon dioxide (CO_2) gas is an American Veterinary Medical Association (AVMA) approved euthanasia method which is sometimes used to euthanize birds and mammals which are captured in live traps or by chemical immobilization and when relocation is not a feasible option. Live animals are placed in a container or chamber into which CO_2 gas is released. The animals quickly expire after inhaling the gas.

3.2.5 Alternative 2 - Non-lethal WDM Only By WS

This alternative would require that WS only utilize non-lethal methods (3.4.2.1 and 3.4.2.2) in addressing wildlife damage problems For other types of WDM problems, airport personnel, or government contractors could conduct WDM activities including the use of traps**,** shooting, and any lethal or non-lethal methods they deem effective. However, DRC-1339 and Alpha-chloralose are currently only available for use by WS employees. Therefore use of these chemicals by private individuals would be illegal and private and commercial applicators would be left only with using other alternatives such as Avitrol if chemical control was needed. However, under this alternative DRC-1339 would not be available, and Alpha-Chloralose would be used to capture and relocate wildlife.

3.2.6 Alternative 3 - Lethal WDM Only By WS

This alternative would require that WS only utilize lethal control methods (3.2.4.3 and 3.2.4.4) in addressing wildlife damage problems, including lethal technical assistance recommendations. WS would provide recommendations to the FWS and MDC regarding the issuance of permits to resource owners to allow them to take wildlife by lethal methods. Airport personnel, or contractors could conduct WDM activities including the use of traps**,** shooting, and any lethal or non-lethal methods they deem effective. DRC-1339 and Alpha-chloralose would be available for use by WS employees. Private and commercial applicators would be left with the alternative of using a chemical repellent such as Avitrol or Flight Control. Under this alternative, animals captured by Alpha-chloralose would be euthanized by an approved method.

3.2.7 Alternative 4 - No Federal WS Wildlife Damage Management

This alternative would consist of no federal involvement in WDM at Missouri airports -- neither direct operational management assistance nor technical assistance to provide information on non-lethal and/or lethal management techniques would be available from WS. Airport personnel, or contractors would be left with the option to conduct WDM activities including the use of traps**,** shooting, and any lethal or non-lethal methods they deem effective with the exceptions of DRC-1339 and Alpha-chloralose which is currently only available for use by WS employees. Therefore use of these chemicals by private individuals would be illegal and private and commercial applicators would be left only with using other alternatives such as Avitrol if chemical control was needed.

3.3 Alternatives Considered But Not Analyzed in Detail With Rationale

3.3.1 Technical Assistance Only

This alternative would not allow WS operational WDM at Missouri airports. WS would only provide technical assistance and make recommendations when requested. This alternative has been determined ineffective based upon the unsuccessful attempts by airport personnel to conduct WDM prior to WS direct control involvement.

3.4 Mitigation and Standard Operating Procedures for Wildlife Damage Management Techniques

3.4.1 Mitigation in Standard Operating Procedures (SOP)

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Missouri uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997). Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS's Standard Operating Procedures include:

Mitigation Measures	Alternatives			
	1	2	3	4
Animal Welfare and Humanness of Methods Used by WS				
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.	**X**	X	X	
The Decision Model (Slate et al. 1992) is used to identify effective biological and ecologically sound WDM strategies and their impacts.	X	X	X	
Captured non-target animals are relocated unless it is determined by the Missouri WS personnel that the animal would not survive	X	X	X	
The use of traps and snares conform to current laws and regulations administered by MDC and Missouri WS policy	X	X	X	
Euthanasia procedure approved by the AVMA that cause minimal pain are used for live animals	X		X	
Drugs are used according to the Drug Enforcement Agency, FDA and WS program policies and directives and procedures are followed that do not cause pain.	X	X	X	
The use of newly developed, proven non-lethal methods would be encouraged when appropriate.	X	X		
Safety Concerns Regarding WS WDM Methods				
All pesticides are registered with the EPA and MDNR	X	X	X	
EPA-approved label directions would be followed by WS employees	X	X	X	
The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, is used to determine WDM strategies	X	X	X	
WS employees that use pesticides are trained to use each material and are certified to use pesticides under EPA approved certification programs.	X	X	X	
WS employees, who use pesticides, participate in MDNR approved continuing education to keep abreast of developments and maintain their certifications.	X	X	X	
Pesticide use, storage, and disposal conform to label instructions and other applicable laws and regulations, and Executive Order 12898.	X	X	X	
Material Safety Data Sheets for pesticides are provided to all WS personnel involved with specific WDM activities.	X	X	X	
Concerns about Impacts of WDM on Target Species, T&E Species, Species of Special Concern, and Non-target Species				
WS consulted with the USFWS regarding the nation-wide program and would continue to implement all applicable measure identified by the USFWS to ensure protection of T&E species.	X	X	X	
Management actions would be directed toward localized populations or groups and/or individual offending animals.	X	X	X	
WS personnel are trained and experienced to select the most appropriate methods for taking targeted animals and excluding non-target species.	X	X	X	
WS would initiate informal consultation with the USFWS following any incidental take of T&E species.	X		X	
The presence of non-target species is monitored before using DRC-1339 to control starlings, blackbirds and pigeons to reduce the risk of significant mortality of non-target species populations.	X		X	

WS take is monitored by number of animals by species or species groups (i.e. blackbirds, raptors) with overall populations or trends in population to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4)	X		X	
WS uses chemical methods for WDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.	X	X	X	

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the proposed action to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the proposed action or current program alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The background and baseline information presented in the analysis of the current program alternative thus also applies to the analysis of each of the other alternatives.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Impacts: Discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the National Historic Preservation Act: WS WDM actions are not undertakings that could adversely affect historic resources (See Section 1.7.2.5).

4.1 Environmental Consequences for Issues Analyzed in Detail

4.1.1 Effects on Target Species Wildlife Populations

4.1.1.1 Alternative 1. - Continue the Current Federal Wildlife Damage Management Program (The Proposed Action as described in Chapter 1)

Analysis of this issue is limited primarily to those species most often killed during WS WDM. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1994). Magnitude is described in USDA (1994) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. Table 4-1 shows the numbers of birds and mammals killed by species and methods as a result of WS WDM activities at MO airports from CY 97 through July 2000. . WS's activities in resolving wildlife damage have been more than 99% non-lethal -- for example; for the 3-year period from FY 97 through 99, the number of mixed blackbirds species including starlings, red-winged blackbirds, and brown-headed cowbirds, killed by WS personnel was 62 while the number moved by used of harassment with pyrotechnics totaled an estimated 291,506 (Figure 3-2). Under this alternative the number of birds and mammals would likely remain the same or not change substantially. If the numbers do change, WS will address the issue in the annual monitoring reports.

Table 4-1. Wildlife Lethally Removed by WS for Wildlife Damage Management in CY 97, 98, 99 and to 7-00 At MO Airports.

Species	Damage Management Methods									
	Alpha Chloro-lose	DRC-1339/Gas Cart.	Body Gripping Trap	Other Trap	Cage Trap	Shooting	Leghold Trap	Egg Destruction/ Nest Removal	Snares	Hand Caught
Badger						1				
Mixed Blackbird Species					8	181				
Red-winged Blackbird				15	7	36	1			
Yellow-headed Blackbird						1				
Bobcat						1				
Feral Cats						4				
American Coot						4				
Brown-headed Cowbird				99	20	446				
Coyote						12	10		10	
American Crow				1		27				
White-tailed Deer						36				
Mourning Dove						51				
Dabbling Ducks						6				
House Finch						16				
Purple Finch						2				
Gray Fox							1			
Red Fox						5	2		2	
Gallin. Rails						3				
Great Egret						1				
Canada Geese						22		129		
Snow Geese						2				
Common Grackles				42	7	7				
Great-tail Grackles						1				
Other Grackles				7		3				
Ringed-billed Gulls						2				
Great Blue Heron						1				
Red-tailed Hawk				3		10	1			
Northern Harrier						3				
Kestrel				12		2	1			
Killdeer						63	1			
Horned Larks						184				
Purple Martin						6				
Meadow Larks						96	10			
Mallards						55				
Muskrats			6			75				
Nighthawks						1				
Barred Owl						3				
Great Horned Owl						2				
Other Owl				1						
Pigeons		150				581		7		
Cottontail Rabbit						1				
Raccoon						7	3		4	

American Robin						3				
Barn Swallows						18				
Other Swallows						56				
Tree Swallow						5				
Striped Skunks						4			1	
European Starlings				39	33	215		1		1
Woodchucks		180				1				

[1] Birds reported as killed were due to incidental moralities or euthanasia associated with live-capture by alpha-chloralose.
[2]Estimated Number of Pigeons taken by pre-baiting population counts.
3Estimated number of woodchucks taken based on one gas cartridge. Per den and maximum # of 8 per den.

Table 4-2 Wildlife Harassed and Lethally Removed by WS for Wildlife Damage Management in CY 97-99 at MO Airports.

Species	Killed 97	Dispersed/Freed 97	Killed 98	Dispersed/Freed 98	Killed 99	Dispersed/Freed 99
Black Birds Mixed Species	1	188,285	149	809,286	348	110632
Brown-headed Cowbirds	104	500	352	3838	119	0
Am. Coot	0	100	0	0	0	0
Am. Crow	0	27	6	159	8	126
Mourning dove	11	205	21	60	19	78
Dabbling Ducks	0	208	3	0	37	174
Diving Ducks	0	0	0	0	0	50
Canada Geese	56	165	68	317	27	186
Snow Geese	0	125	0	0	2	3190
Grackles	0	20	8	150	52	0
Grebes	0	0	0	0	0	0
Gulls	0	116	1	59	0	23
Great Blue Herons	0	5	0	0	1	0
Hawks /Kestrels	17	78	19	227	10	182
Killdeer	8	317	22	405	31	102
Horned Lark	4	1257	92	2001	59	1449
Purple Finch	0	0	16	0	0	0
Purple Martin	5	75	0	0	1	0
Meadow lark	0	145	29	324	3	0
Nighthawk	0	0	0	0	1	0
Owls	0	5	10	8	0	2
Pigeons	331	15	351	20	26	9
Plovers	0	30	0	0	0	24
Am Robin	0	0	3	150	0	0
Shorebirds	0	6	0	53	0	3

Swallows – Tree, barn, & cliff.	2	372	67	500	41	1138
Terns	0	40	0	0	1	8
Turkey	0	36	0	32	0	0
Turkey Vultures	0	37	0	160	0	77
Badger	0	0	0	0	2	0
Beaver	1	0	0	0	0	0
Bobcat	0	0	0	1	0	0
Coyotes	14		5	3	9	2
Deer	0	0	27	3	0	7
Dogs (feral)	0	2	0	0	0	0
Field Mice	0	0	0	0	0	0
Feral Cats	0	1	1	32	0	0
Fox	0	0	8	1	2	11
Muskrat	0	0	22	0	46	0
Opossum	0	4	1	0	0	1
Raccoon	1	3	1	3	9	1
Skunks	0	0	0	0	3	0
Woodchuck	180	0	0	0	0	0

Starling and Blackbird Population Impacts

Colonization of North America by the European Starling began on March 6, 1890 when a Mr. Eugene Scheifflin, a member of the Acclimatization Society, released 80 starlings into New York's Central Park. The birds thrived and exploited their new habitat. By 1918, the advance line of migrant juveniles extended from Ohio to Alabama; by 1926 from Illinois to Texas; by 1941 from Idaho to New Mexico; and by 1946 to California and Canadian coasts (Miller 1975). In just 50 short years the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984).

Precise counts of blackbird and starling populations do not exist but one estimate placed the United States summer population of the blackbird group at over 1 billion (USDA 1997) and the winter population at 500 million (Royall 1977). The majority of these birds occur in the eastern U.S.; for example surveys in the southeastern part of the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981). Meanley and Royal (1976) estimated 538 million blackbirds and starlings in winter roosts across the country during the winter of 1974-75.

An extensive population survey by Dolbeer and Stehn published in 1979 showed that, in the southwestern U.S., the number of breeding starlings doubled between 1968 and 1976. In California, where starlings were first observed in 1942, the number of breeding birds increased by 19% during the same period. Breeding Bird Survey data from Hines et al. (1998) indicate a slight increase (0.8% per year) in the starling breeding population in the central U.S. from 1966 -1998, and a slight decrease (2.7% per year) from 1980 - 1994. Breeding Bird Survey data for Missouri indicates starling populations stable or slightly increasing from 1980 to 1998. Red-winged blackbirds showed a stable population in the Missouri and slightly down (0.4% per year) in the central region of the United States. Brown-headed cowbirds showed a steady increase of 2.3% from 1968 to 1979 and a slight decline from 1980 to 1998 with a decline of 0.6%(Sauer et al. 2000).

The nationwide starling population has been estimated at 140 million (Johnson and Glahn 1994). The winter starling population in the northwest and southwest regions has been estimated at 27.8 million (Meanley and Royall 1976). The northwest and southwest regional population of the blackbird group is 139 million of which 27.8 million are starlings (Meanley and Royall 1976).

All of the above information indicates that populations of starlings and blackbirds have been relatively stable in recent years. For most species that show upward or downward trends, such trends have been relatively gradual. Additionally, blackbird populations are healthy enough, and the problems they cause great enough, that the USFWS has established a standing depredation order for use by the public. Under this "order" (50 CFR 21.43), no Federal permit is required by anyone to remove blackbirds if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.

During CY 97- 99, MO WS personnel at MO Airports lethally 366 blackbirds and 113 European starlings off the flightlines and airfields. States in the WS Eastern Region reported a total kill of between 67,416 and 243,110 blackbirds and starlings per year. The average annual reported kill was 131,068 blackbirds and starlings (data from WS MIS system). No other sources of major human-caused blackbird and starling mortality are known.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). The northwest and southwest regional population of the blackbird group has been estimated to be about 140 million of which about 28 million are starlings (Meanley and Royall 1976). Estimated natural mortality of the blackbird group should therefore be between 60 and 75 million birds annually. WS kill of blackbirds and starlings at Missouri airports has been less than .0000079% of the estimated natural mortality of these populations, and would be expected to be no more than .004% of total mortality in any one year under the current program. The number of birds killed by the MO WS program amounts to only 0.0000079% of the regional wintering population. Regionally, WS's *confirmed kill*, which may be underestimated, averages less than a 131,068 blackbirds and starlings annually, which accounts for only 0.218% of the natural mortality. Even if WS's actual regional kill is much higher than the "confirmed" kill, it should continue to be well below normal mortality levels for these populations.

Dolbeer et al. (1995) showed that WS kills of 3.6% of the wintering population had no effect on breeding populations the following spring. Dolbeer et al. (1976) constructed a population model which indicated that a reduction of 14.8% of the wintering blackbird population would reduce the spring breeding population by 20% and that a 56.2% reduction in the wintering blackbird population would reduce spring breeding populations by only 33%. Given the density-dependent relationships in a blackbird population (i.e. decreased mortality and increased fecundity of surviving birds) a much higher number would likely have to be killed in order to impact the regional breeding population.

Cumulative impacts would be mortality caused by the MO WS program added to the other known human causes of mortality. Given that the maximum annual mortality caused by the MO WS program has not accounted for more than 0.00000003-% of the regional blackbird population, and should not exceed 0.5% of the population in any future year, the proposed control projects implemented under this alternative would have no significant impact on overall breeding populations.

Starlings, being non-indigenous and because of their negative impacts and competition with native birds, are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in starling populations in North

America, even to the extent of complete eradication, could be considered a beneficial impact to native bird species.

Feral Domestic Pigeon Population Impacts

The feral domestic pigeon, also known as the rock dove, is an introduced nonnative species in North America. Breeding Bird Survey data indicate the species has been stable across the western United States from 1967 through 1995 (Sauer et al. 1997). Federal or state law does not protect the species. Any WDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those cases where feral domestic pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment of pigeons may consider major population reduction in some localities a negative impact.

Between CY 97 and CY 99, MO WS @ MO Airports took 738 pigeons, primarily to reduce hazards associated with dropping and damage in and around hangers. This number of pigeons taken at multiple sites undoubtedly had little effect on overall pigeon populations in Missouri.

Horned Lark Population Impacts

Horned Larks (*Eremophila alpestris*) are a small passerine that is found throughout North America. Breeding Bird Survey data indicates the species has been stable or slightly decreasing across the United States from 1967 to 1995 (Sauer et al. 1999). Horned larks are a widespread occupant of open habitats and prefer areas with sparse vegetation and exposed soil. In eastern North America, most pairs occupy tilled fields, the grassy fields bordering airports and similar habitats and are occasionally found in vacant lots within cities (Sauer et. al. 1999). The hazards that these bird present to human health and safety is tremendous. The horned lark is the single most common bird struck by aircraft in the U.S. Air Force, and is 11th in cost damage of $2,764,273.31 (USAF 2000). Horned Larks are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In CY 97-99 WS @ MO Airports has taken an average of 44 birds per year, while harassing more than 4,350 birds from it's airfield. There for WS limited take should have minimal effects on Horned Lark populations.

Canada Geese

Canada geese (*Branta canadensis*) are a large waterfowl that is found throughout North America. Breeding Bird Survey data indicates the species has been growing quickly with in Missouri from 1966 to 1998 (Sauer et al. 2000). Canada geese are a widespread occupant of open areas, ponds and wetlands. Their primary diet is vegetative matter the includes items such as grass, corn, and soybeans. Canada geese are also very adaptive to urban settings and often thrive in areas such as public parks and airport retention ponds. The hazards that these birds present to human health and safety is tremendous. The Canada goose is responsible for more than 82 million dollars in damage to USAF aircraft in sixty collisions (USAF BASH Web site 2000).

The state of Missouri monitors populations and sets harvest dates and limits governed by USFWS guidelines. The MDC Mid-Winter 2000 Canada goose count of 128,610 which was lower that in January 1999 (259,800) This was due primarily to the lack of cold weather and poor dry habitat conditions. The first significant cold weather occurred on 20-21 December, lasted 2 days, and then mild weather again prevailed during the remainder of December and early January 2000. Giant Canada geese nesting in Missouri continued to increase in number and good production in spring

2000 ensured a larger fall flight than 1999. The 2001 season in Missouri allowed the following harvest: in the North Zone (except Swan Lake Zone), the Middle Zone, the Southeast Zone, and the South Zone**,** bag limit is 3 Canada geese daily (6 in possession) during 9/30- 10/8 and 2 Canada geese daily (4 in possession) thereafter. In the Swan Lake Zone the bag limit is 2 Canada geese daily (4 in possession). In CY 97-99 WS @ MO Airports has taken an average of 50 birds per year, while harassing more than 660 birds from it's airfield. Statewide, the Canada goose harvest in 1999-2000 numbered 32,500. There for WS limited take should have minimal effects on Canada goose populations.

Swallows

Swallows are a small insectivorous bird from the family *Hirundinidae.* Swallows that are found throughout North America. Within the state of Missouri five species of swallows are common, as well as, the Purple Martin. Breeding Bird Survey data indicates the family have been stable or increasing across the United States from 1980 to 1999. The family as a whole increased by an average of 7.48 %. The greatest population increase was Cliff Swallows at 18%, while the largest decrease was 2.9% (Sauer et al. 2001). Swallows are a widespread occupant of open to semi open land, preferring fields, farmland, marshes and areas near water. The hazards that these bird present to human health and safety is tremendous. Swallows are second most common bird struck by aircraft in the U.S. Air Force, and is 10^{th} in cost damage of $3,268,503.70 (USAF 2000). Swallows are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In CY 97-99 WS @ MO Airports has taken an average of 38.6 birds per year, while harassing more than 2,000 birds from it's airfield. There for WS limited take should have minimal effects on swallow populations.

Other Target Species

Target species in addition to those analyzed above that have been killed in small numbers by WS during the past several years include no more than an average of 20 individuals of a given species per year. (Table 4-1). Other species that could be killed during WDM include any of the species listed in Section 1.2. None of these species are expected to be taken by WS WDM at any level that would adversely affect populations. MDC concurs with WS will not adversely affect any target species populations. (MDC Letters July and August 2000, Ziehmer, and Fantz)

Abundance and Distribution of Deer.
The MDC is responsible for the management and monitoring of the states White-tailed deer (*Odocoileus virginianus*), which is done through management units using spotlight counts and harvest data. MDC has divided the state in to 59 deer management units. Populations vary from unit to unit depending on the quality of habitat. For Example in unit 19, the unit wide minimum autumn (1999) pre-hunting population is estimated by the MDC to be 25,015 deer per 156 sq miles of forested habitat. Unit 6 population is estimated at 25,045 animals but occupies less area at 110 sq. miles of forested habitat. Further more management unit 42 hosts an estimated 8,500 deer per 1,645 sq. miles of forested habitat (MDC Hensen by verbal contact). Deer are present in most of the management units, and occupy almost all undeveloped land that contains suitable deer habitat. The MDC who is the agency responsible for the management of deer concurs that the action take by WS will not have any negative impacts on the states or management units deer populations (MDC Letter 2000). WS work at airports in Missouri has resulted in the removal of less the 27 deer during CY97-99. This is a minimal number of animals compared to the states 2000/2001 harvest on more than 34,800 deer. (MDC web site 2001)

Overall, the state's deer population is healthy and productive, with statewide population exceeding 750,000 animals (MDC web site 2000). Though the state wide deer population has remained relatively stable for the past several years, significant increases in local areas have occurred. These

increases are likely due to a number of factors, including 1. Poor hunter access to land occupied by deer, 2. Local and state ordinances limiting hunting and/or discharge and use of firearms and bows, 3.Improved habitat and better management practices. In MO, there are approximately 8,700 deer-vehicle collisions each year, with many collisions and near misses going unreported (MDC Hensen 2000)

Woodchuck and Muskrat

The MDC is responsible for the management of the states Woodchuck (*Mormota monax*) and Muskrat *(Ondatra zibethica*) populations. At this time MDC does not conduct population census for these species, but does monitor the sale of hides. Currently, MDC has open seasons that are as follows: Woodchuck/Groundhog may be taken/hunted from 5/14/01 to 12/15/01 with no limit. Muskrats may be trapped November 20, 2000 to January 20, 2001 with no restriction on limit.

During CY 97 WS took a maximum of 180 Woodchuck and in CY 97-99 an average of 22.6 Muskrat; with the states liberal harvest regulations, the magnitude of WS take on these species would be minimal. This is supported by the basic biology of the species. The muskrat is prolific, and may have up to three litters during the summer. The first litter, sometimes 12 to 15, are born in March, and can have their own litter before fall arrives. If a pair of muskrats and their offspring all survived to breed as soon as possible, they could produce over 600 muskrats in just 2 years. (MDC Furbearer Web page 2001). Woodchucks have one litter a year that ranges from 2-6 young. The off-spring breed at age 1 and live 4-5 years. If a pair of woodchucks and their offspring all survived to breed as soon as possible, with an average litter size of 4 with a 1:1 sex ratio; they could produce over 645 woodchucks through their life time.

4.1.1.2 Alternative 2 - Non-lethal WDM Only by WS

Under this alternative, WS would not lethally take any target species and only non-lethal WDM activities and technical assistance recommendations would be made or implemented. Although WS take of target wildlife species would not occur, it is likely that, without WS conducting some level of lethal WDM activities, airport personnel or contractors WDM efforts would increase, leading to similar or greater impacts on target species populations as those of the current program alternative. For the same reasons shown in the population impacts analysis in section 4.1.1.1, however, it is unlikely that target wildlife populations would be impacted adversely affected by implementation of this alternative

4.1.1.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, WS would likely have a greater impact on the target species population at Missouri airports and the surrounding area than Alternative 1 (No Action/Proposed Action). Only lethal WDM activities would be implemented to resolve wildlife damage in all situations. WS would not recommended or use any non-lethal WDM activities to reduce wildlife damage at Missouri airports. It is likely that a greater number of birds and mammals would likely have to be removed lethally to attempt to achieve the same results as the proposed action. For the same reasons shown in the population impacts analysis in section 4.1.1.1, however, it is unlikely that target wildlife populations would be impacted adversely affected by implementation of this alternative

4.1.1.4 Alternative 4 -No Federal WS WDM

Under this alternative, WS would have no impact on target species populations at Missouri airports and the surrounding area. Airport efforts to reduce or prevent wildlife conflict could increase which could result in impacts on target species populations to an unknown degree. Impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by airport personnel and/or contractors. For the same reasons shown in the population impacts analysis in section 4.1.1.1 it is unlikely that target bird and mammal populations would be impacted adversely affected by implementation of this alternative.

4.1.2 Effects on Non-target Species Populations, including Threatened and Endangered Species.

4.1.2.1 Alternative 1 - Continue the Current Federal Bird Damage Management Program (The No Action/Proposed Action)

Adverse Impacts on Non-target (non-T&E) Species. There has been no take of non-target species by WS during WDM activities during FY 97 - 00. While every precaution is taken to safeguard against taking non-target species, at times changes in local animal movement patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the current program.

T&E Species Impacts.

Federal Listed T&E Birds and Mammals In Missouri

E -- Bat, gray (*Myotis grisescens*)
E -- Bat, Indiana (*Myotis sodalis*)
E -- Bat, Ozark big-eared (*Corynorhinus townsendii ingens*)
T -- Eagle, bald (*Haliaeetus leucocephalus*)
T -- Plover, piping (*Charadrius melodus*)
E -- Puma, eastern (*Puma concolor couguar*)
E -- Tern, least (*Sterna antillarum*)

(Species listed on by the Federal List are currents as of May24, 2000 posted on USFWS web site.)

State Listed T&E Birds and Mammals

Northern Harrier (*Circus cyaneus*), Interior Least Tern (*Sterna albifrons*), Barn-Owl (*Tyto alba*), Swainson's Warbler (*Limnothlypis swainsonii*), Snowy Egret (*Egretta thula*), King Rail (*Rallus elegans*), Bachman's Sparrow (*Aimophila aestivalis*), Bald Eagle (*Haliaeetus lecocephalus*), Peregrine Falcon (*Falco mexicanus*), American Bittern (*botaurus lentiginosus*), Greater Prairie-chicken (*Tympanuchus cupido*).

Gray Bat (*Myotis grisescens*), Ozark Big-eared Bat (*Corynorhinus townsendii ingens*, Indiana Bat (*Myotis sodalis*), Mountain Lion, (*Puma concolor couguar*), Black-tailed Jackrabbit (*Lepus californicus*), Spotted Skunk (*Spilogale putorius)*. (Wildlife code of Missouri 3CRS10-4.111)

WS has obtained a list of the T&E species and has concluded that WDM activities at Missouri airports would not adversely affect any Federal or State listed T&E species, including those listed above. WS has conducted an informal section 7 with the USFWS and MDC, who MDC concurs with WS findings. WS has reviewed the list of concerns raised by the USFWS. The USFWS provide guidelines to reduce potential negative impacts to Bald eagles (*Haliaeetus leucocephalus*), Gray *Bat (Myotis grisescens*), Indiana bat (*Myotis sodalis*) and eight plant species for

those persons implementing habitat alterations recommended by WS (K. Srigley-Wemer, USFWS, February 7, 2001Letter). WS will notify landowners of their responsibilities relating to T&E species when habitat alteration is recommended by WS.

The 1992 Biological Opinion (B.O.) from the USFWS concluded that the brown pelican, interior least tern, and piping plover would not be adversely affected by any aspect of the WS program which included all methods of WDM described herein (USDA 1997, Appendix F).

DRC-1339 poses no primary hazard to eagles because eagles do not eat grain or other bait materials on which this chemical might be applied during WDM, and, further, because eagles are highly resistant to DRC-1339. Up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS WDM at MO Airports will have no adverse effects on bald eagles.

Mitigation measures to avoid non-target and T&E species impacts are described in Chapter 3 (section 3.4.2.2). The inherent safety features of DRC-1339 use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the ADC FEIS (USDA 1997, Appendix P). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from the proposed action.

4.1.2.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS take of non-target animals would probably be less than that of the proposed action because WS would take no lethal control actions. However, non-target take would not differ substantially from the current program because the current program has taken no non-target animals during CY 97-99. On the other hand, MO Airports whose wildlife damage problems were not effectively resolved by non-lethal control methods and recommendations would likely resort to other means of lethal control such as use of shooting by airport personnel or contractors. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.2.3 Alternative 3 Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be recommended and implemented to resolve wildlife conflicts in all situations. WS would not recommended or use any non-lethal WDM activities to reduce wildlife damage at MO Airports. WS take of non-targets would not differ substantially from the current program described in section 4.1.2.1. Since all WDM control methods would not be available for use by WS, wildlife conflicts may not be reduced to an acceptable level leading to non-WS personnel implementing their own WDM activities. Although technical support, might lead to more selective use of lethal control methods by non-WS personnel than that which might occur under Alternative 2, airport efforts to reduce or prevent damage could still result in less experienced persons implementing control methods leading to greater take of non-target wildlife than under the proposed action

4.1.2.4 Alternative 4 - No Federal WS WDM

Alternative 4 would not allow any WS WDM at any MO Airport. There would be no impact on non-target or T&E species by WS WDM activities from this alternative. However, airport efforts to reduce or prevent conflicts could increase, which could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than under the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.3 Economic Losses to Property as a Result of Wildlife Damage

4.1.3.1 Alternative 1- Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

MO Airports are concerned with the economic cost associated with damage caused by wildlife to aircraft and other airport property. Wildlife can cause severe damage or total loss to aircraft, structural damage to aircraft hangers and airport buildings, obstruction and damage of water control structures, and damage to the perimeter security fencing. Integrated WDM, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing the risk of wildlife damage. All WDM methods could possibly be implemented and recommended by WS.

Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with wildlife damage. Wildlife damage could increase under this alternative if non-lethal techniques were ineffective. Airport personnel requesting WDM assistance to reduce wildlife damage would not be provided information or services in lethal control. If non-lethal methods did not reduce or eliminate the wildlife damage no other WS options would be available. Airport personnel would then be required to implement their own lethal program with potential for limited success, depending upon the expertise of the personnel involved. Therefore wildlife damage to property could remain the same or greater than the proposed action.

.

Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended to resolve wildlife damage to property in all situations. DRC-1339 would be available for use, however, due to safety considerations and airport regulations all lethal WDM methods would not be available for use in all situations. In areas where lethal WDM could not be conducted, such as areas on airports where discharge of firearms is not safe or allowed, wildlife damage would not be reduced. In these situations WS would not be able to recommend or use non-lethal methods that otherwise would be available under the proposed action. If airport personnel did not implement their own non-lethal program in this particular situation, the likely results would be wildlife damage to property remaining the same or increasing. Overall impacts on wildlife damage, to property would likely be greater under of this alternative than the proposed action.

Alternative 4 - No Federal WS WDM

With no WS assistance, airport personnel would be responsible for developing and implementing their own WDM program. Negative impacts on wildlife damage to property would likely be greater under this alternative than the proposed action. . Airport efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods, therefore leading to a greater potential of not reducing wildlife property damage, than under the proposed action.

4.1.4Effects on Human Health and Safety

4.1.4.1 Impacts of chemical WDM methods on human health

4.1.4.1.1 Alternative 1 - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

DRC-1339 (3-chloro-p-toluidine hydrochloride). DRC-1339 is the primary lethal chemical method that would be used under the current program alternative for lethal bird control. There has been some concern expressed by a few members of the public that unknown but significant risks to human health may exist from DRC-1339 used for WDM.

This chemical is one of the most extensively researched and evaluated pesticides ever developed. Over 30 years of studies have demonstrated the safety and efficacy of this compound. Appendix B provides more detailed information on this chemical and its use in BDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- Its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions expressed by a few members of the public, DRC-1339 is not applied to feed materials that livestock can feed upon).

- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that treated bait material generally is nearly 100% broken down within a week.

- It is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.

- Application rates are extremely low (less than 0.1 lb. of active ingredient per acre) (EPA 1995).

- A human would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur.

- The EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Regardless, however, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

The above analysis indicates that human health risks from DRC-1339 use would be virtually nonexistent under any alternative.

Avitrol (4-Aminopyridine). Avitrol is another chemical method that might be used by WS for bird control. Although this chemical was not identified as being one of concern for human health effects, analysis of the potential for adverse effects is presented here. Appendix B provides more detailed information on this chemical.

Avitrol is available as a prepared grain bait mixture that is mixed in with clean bait at no greater than a 1:9 treated to untreated mixture. In addition to this factor, other factors that virtually eliminate health risks to members of the public from use of this product as an avicide are:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 1996). Therefore, little of the chemical remains in killed birds to present a hazard to humans.

- A human would need to ingest the internal organs of birds found dead from Avitrol ingestion to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur. Furthermore, secondary

hazard studies with mammals and birds have shown that there is virtually no hazard of secondary poisoning.

- Although Avitrol has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997) . Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the extremely controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical.

The above analysis indicates that human health risks from Avitrol use would be virtually nonexistent under any alternative.

Other WDM Chemicals. Other non-lethal WDM chemicals that might be used or recommended by WS include repellents such as methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption) and Flight Control, which are used as an area repellent, and the tranquilizer drug Alpha-chloralose. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before EPA or FDA would register them. Any operational uses of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations that are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997).

Alternative 2 – Non-lethal WDM Only by WS

Alternative 2 would not allow for any lethal methods use by WS at MO Airports. WS could only implement non-lethal methods such as harassment and exclusion devices and materials. Non-lethal methods could, however, include the tranquilizer drug Alpha-chloralose and chemical repellents such as methyl anthranilate which, although already considered safe for human consumption because it is artificial grape flavoring, and Flight Control which might nonetheless raise concerns about human health risks. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before EPA or FDA registers them. Any operational use of chemical repellents and tranquilizer drugs would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations and FDA rules, which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Alternative 3 - - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented to resolve wildlife damage in all situations. WS would not recommended or use any non-lethal WDM activities to reduce bird and mammal damage. WS's use of chemical WDM methods would not differ substantially from the current program described in section 4.1.4.1.

Alternative 4 - No Federal WS Wildlife Damage Management

Alternative 4 would not allow any WS WDM at MO Airports. Concerns about human health risks from WS's use of chemical WDM methods would be alleviated because no such use would occur. DRC-1339 and Alpha-Chloralose are only registered for use by WS personnel and would not be available for use by airport personnel or government contractors. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS's assistance. However, use of Avitrol in accordance with label requirements should avoid any hazard to members of the public.

4.1.4.2 Impacts on human safety of non-chemical WDM methods

Alternative 1 - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Non-chemical WDM methods that might raise safety concerns include shooting with firearms, use of traps and snares, and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS traps are strategically placed to minimize exposure to airport personnel and pets. Body-grip (i.e. Conibear) traps for beaver and muskrats are restricted to water sets, which further reduces threats to public and pet health and safety. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The MO WS program has had no accidents involving the use of firearms, traps, or pyrotechnics in which a member of the armed forces or the public were harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse impacts on human safety from WS's use of these methods are expected.

Alternative 2- Non-lethal by WDM Only by WS

Under this alternative, WS would not use firearms for lethal control during WDM but would still be able to use them as a harassment method. WS would also use pyrotechnics. Risks to human safety from WS's use of firearms, lethal control and pyrotechnics hypothetically would be similar to the current program alternative. MO WS's current WDM program has an excellent safety record of no accidents involving these devices have occurred resulting in a member of the armed forces or public being harmed. Increased use of these devices by less experienced and trained individuals would probably occur under this alternative. Impacts from this alternative could be greater or about the same as the proposed action..

Alternative 3 – Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented to resolve wildlife damage in all situations. WS would not recommended or use any non-lethal WDM activities to reduce wildlife damage. WS's use of non-chemical lethal WDM methods, the use of firearms, and body-gripping traps, would not differ substantially from the current program described in Alternative 1. Although technical support, might lead to more selective use of lethal control methods by airports personnel than that which might occur under Alternative 2, efforts to reduce or prevent conflicts could still result in less experienced persons implementing control methods. Resulting in risks to human safety similar to Alternative 2, but to a lesser extent than Alternative 4 because some of these personnel would be receiving advice and instruction from WS.

Alternative 4 - - No Federal WS Wildlife Damage Management

Under this alternative, WS would not engage in or recommend use of any non-chemical WDM methods. Risks to human safety from WS's use of firearms, traps, snares, and pyrotechnics would hypothetically be lower than the current program alternative. However, increased use of firearms, traps, snares, and pyrotechnics by less experienced and trained private individuals would probably

occur without WS assistance. Risks to human safety under this alternative, could increase or remain about the same as the proposed action.

4.1.4.3 Impacts on human safety from Wildlife strike hazards to aircraft

Alternative 1 - - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action

Airport personnel are concerned with potential injury and loss of human life as a result of wildlife/aircraft collisions. Integrated WDM, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing the risk of wildlife aircraft strikes. All WDM methods could possibly be implemented and recommended by WS.

Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with wildlife damage. Wildlife strikes could increase under this alternative if non-lethal techniques were ineffective. Airport personnel requesting WDM assistance to reduce wildlife strikes would not be provided information or services in lethal control. If non-lethal methods did not reduce or eliminate the wildlife hazard, no other WS options would be available. Airport personnel would then be required to implement their own lethal program with success, dependent upon the expertise of the personnel involved. Therefore wildlife strike hazards could be greater or remain the same as the proposed action.

.

Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended to resolve wildlife strike hazards in all situations. DRC-1339 would be available for use, however, due to safety considerations and airport regulations all lethal WDM methods would not be available for use in all situations. In areas where lethal WDM could not be conducted, such as areas on airfield where discharge of firearms is not safe or allowed, wildlife strikes would not be reduced. In these situations WS would not be able to recommend or use non-lethal methods that otherwise would be available under the proposed action. If airport personnel did not implement their own non-lethal program in this particular situation, the likely results would be the number of wildlife strikes remaining the same or increasing. Therefore, impacts on human safety could be greater under this alternative than the proposed action.

Alternative 4 - No Federal WS WDM

With no WS assistance, airport personnel would be responsible for developing and implementing their own WDM program. Airport efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods, therefore leading to a greater potential of not reducing wildlife strikes, than under the proposed action.

4.1.5 Effects on Aesthetics

4.1.5.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species

Alternative 1 - - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Some people who routinely view or feed individual birds and mammals such as geese and deer would likely be disturbed by removal of such animals under the current program. Some people have expressed opposition to the killing of any animal during WDM activities. Under the current program, some lethal control of wildlife would continue and these persons would continue to be opposed. However, many persons who voice opposition has no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, insubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest.

Some people do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. Some people who enjoy viewing wildlife would feel their interests are harmed by WS's non-lethal harassment program. Mitigating that impact, however, is the fact that a harassment program does not diminish overall numbers of wild animals in the area. People who like to view these species can still do so on State wildlife management areas, as well as numerous private property sites where the owners are not experiencing damage from wild birds mammals and are tolerant of their presence.

Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would not conduct any lethal WDM but would still conduct harassment of wildlife that was causing damage. Some people who oppose lethal control of wildlife by government but are tolerant of government involvement in non-lethal wildlife damage management would favor this alternative.

Some people do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. Some people who enjoy viewing wildlife would feel their interests are harmed by WS's non-lethal harassment program. Mitigating that impact, however, is the fact that a harassment program does not diminish overall numbers of wild animals in the area. People who like to view these species can still do so on State wildlife management areas, as well as numerous private property sites where the owners are not experiencing damage from wild birds and mammals and are tolerant of their presence.

Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS's lethal WDM activities under this alternative because WS would not kill the individual animal(s). However, airport personnel would likely conduct lethal WDM activities that would no longer be conducted by WS. Therefore the impacts of this alternative would be similar to the proposed action.

Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. People that have expressed opposition to the killing of any bird or mammal during WDM activities would likely be opposed to this alternative. Non-lethal methods would not be used or recommended by WS, therefore impacts of this alternative would be greater than the propose action.

Alternative 4 - No Federal WS WDM

Under this alternative, WS would not conduct any lethal or non-lethal WDM activities. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS's activities under this alternative. However, airport personnel or their contractors would likely conduct similar WDM activities as those that would no longer be conducted by WS, resulting in impacts similar to the current program alternative.

4.1.5.2 Effects on Aesthetic Values of Property Damaged by Birds

Alternative 1 - - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Under this alternative, WS would provide operational and technical assistance in reducing bird problems in which droppings are causing a unsightly mess and would, if successful improve aesthetic values of affected properties in the view of the landowner. All WDM methods would be available for use, including the use of DRC-1339 and Alpha-chloralose. Relocation of nuisance roosting birds by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities to monitor the birds' movements is generally conducted to assure they do not reestablish in other undesirable locations.

Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would only provide non-lethal operational and technical assistance in reducing problems in which droppings from birds are causing a unsightly mess and would, if successful improve aesthetic values of affected properties in the view of the land owner. Relocation of nuisance roosting birds by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities to monitor the birds' movements are generally conducted to assure they do not reestablish in other undesirable locations. If non-lethal WDM methods are not effective in reducing bird problems WS would not be able to recommend or implement any potential successful lethal WDM method. Airport personnel would then have the option of doing nothing, which would not reduce the problem, or implement their own control methods, which can have varying success. Overall, impacts of improving aesthetics would be slightly less than the proposed action.

Alternative 3 -. Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. This alternative would result in nuisance birds being removed by lethal means only. Where lethal WDM could be conducted bird damage would likely be reduced to acceptable levels. In areas where lethal WDM could not be conducted, such as areas on airports where discharge of firearms is not safe or allowed, bird damage would not be reduced. Airports would be required to develop and implement their own non-lethal WDM programs. Relocation of nuisance birds or bird roosts through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS does not provided non-lethal assistance to airport personnel, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could likely result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

Alternative 4 - No Federal WS WDM

Under this alternative, WS would not provide any operational or technical assistance in reducing bird problems. Aesthetic values of the landowner would continue to be adversely affected, if airport personnel were not able to implement there own WDM, or reduce damage in some other way. In many cases, this type of aesthetic "damage" would increase as a result of airport personnel not being able to resolve their problems. Bird numbers would continue to increase, resulting in a greater chance of adverse impacts than with the proposed action.

4.1.6 Humanness and Animal Welfare Concerns of Lethal Methods Used by WS

4.1.6.1 Alternative 1 -- Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Under this alternative, methods viewed by some persons as inhumane would continue to be used in WDM by WS. These methods would include shooting, lethal trapping, snares and toxicants/chemicals such as DRC-1339 and Avitrol. Shooting, when performed by experienced professionals, usually results in a quick death for target animals. Occasionally, however, some birds and mammals are initially wounded and must be shot a second time or must be caught by hand and then dispatched or euthanized. Some persons would view shooting as inhumane. Despite SOP's designed to maximize humaneness, as described in sections 3.4.1, the perceived stress and trauma associated with being held in leghold traps or snares until the WS specialist arrives to dispatch the animal, is unacceptable to some persons. In addition, these methods are used in "drown sets" where the animal drowns shortly after being caught is also considered inhumane by some persons. Other lethal WDM methods used to take target animals include body-gripping traps (i.e., Conibears). These traps result in a relatively humane death because the animals die instantly or within seconds to a few minutes. The primary lethal chemical WDM method that would be used by WS under this alternative would be DRC-1339. This chemical causes a quiet and apparently painless death that results from uremic poisoning and congestion of major organs (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes; which are primarily disease, starvation, and predation. For these reasons, WS considers DRC-1339 use under the current program to be a relatively humane method of lethal WDM. However, despite the apparent painlessness of the effects of this chemical, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable. The chemical Avitrol repels birds by poisoning a few members of a flock, causing them to become hyperactive (see discussion in Appendix B). Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock. The affected birds generally die. Some persons would view Avitrol as inhumane treatment of the affected birds, based on the birds' distress behaviors. Occasionally, birds captured alive by traps, by hand or with nets would be euthanized. The most common method of euthanization would be cervical dislocation and by CO_2 gas which are AVMA-approved euthanasia methods (Andrews et al. 1993) . Most people would view AVMA-approved euthanization methods as humane.

4.1.6.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would not use lethal methods viewed as inhumane by some persons. However, airport personnel may reject non-lethal WDM recommended and provided by WS and would seek alternative lethal means resulting in impacts to humaneness similar to or greater than the proposed action. Impacts of lethal methods implemented by non-WS employees could be similar or greater than the proposed action depending upon their WDM training and experience. Since DRC-1339 would not be available to non-WS entities, the only chemical WDM method that could be legally used by these entities would be Avitrol. Avitrol would most likely be viewed as less humane than DRC-1339 because of the distress behaviors that it causes. Overall, people who perceive the use of lethal control methods by WS as inhumane would prefer this alternative to the proposed action.

4.1.6.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. These methods, which would include shooting, trapping, snares, and the use of toxicants/chemicals such as DRC-1339 and Avitrol, are viewed by some persons as inhumane. Impacts for this alternative would be similar to the proposed action.

4.1.6.4 Alternative 4 - No Federal WS WDM

Under this alternative, lethal methods viewed as inhumane by some persons would not be used or recommended by WS. Similar to Alternative 2, DRC-1339 would no longer be available for use since it is only registered for use by WS personnel. Thus, the only chemical WDM method legally available would be Avitrol which would be viewed by many persons as less humane than DRC-1339. Shooting, and WDM trapping and capture methods could be used by non-WS entities and, similar to the current program alternative, would be viewed by some persons as inhumane. Overall, it is likely that WDM would be similar or somewhat less humane with this alternative than under the proposed action, training and expertise of the person implementing control methods

Table 4-3 summarizes the expected impacts of each of the alternatives on each of the issues.

4.2 Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the 4 alternatives. Under the Proposed Action and Alternative 3, the lethal removal of wildlife would not have a significant impact on overall wild bird and mammal populations in Missouri, but some local reductions may occur. This is supported by the MDC, which is the agency with responsibility for managing wildlife in the State. No risk to public safety is expected when WS' services are provided and accepted by requesting individuals in Alternatives 1,2, and 3, since only trained and experienced wildlife biologists would conduct and recommend WDM activities. There is a slight increased risk to public safety when persons that rejects WS assistance and recommendations in Alternatives 1, 2, and 3 conduct WDM activities, and when no WS assistance is provided in Alternative 4. In all 4 Alternatives, however, it would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS' participation in WDM activities to protect property, and human health and safety, the analysis in this EA indicates that WS Integrated WDM program will not result in significant cumulative adverse impacts on the quality of the human environment.

Table 4-3 Summarizes the expected impact of each of the alternatives on each of the issues.

Issues/Methods	**Alternative 1 -- Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)**	**Alternative 2 – Non-lethal WDM Only by WS**	**Alternative 3- Lethal WDM Only by WS**	**Alternative 4 - No Federal WS WDM**
Effects on Target Wildlife Species Populations	Local populations in areas with damage or threat of damage would be reduce and sustained at a lower level. No effects on state populations.	.Results may equal or be less than the proposed action.	Local populations in areas with damage or threat of damage would be reduce and sustained at a lower level. No effects on state populations	If landowners conducts it own management without WS, results could be similar or greater on population reduction. If not populations and threats would continue to increase.
Effects on other Wildlife Species Populations, including T&E Species	No probable effect.	No probable effect. If landowners chose to conduct lethal removal without WS, non-targets species may increase take.	No probable effect.	If landowners conducts lethal WDM, non-target species take may increase.
Effects of Damage to Property from Wildlife Strikes	The proposed action has the greatest potential of successfully reducing this risk.	Damage to property could remain similar, but could be greater.	Over all impacts to property would likely be greater under this alternative than the proposed action.	Depending on actions taken by the landowner or land manager, results could increase, decrease or remain the same.
Effects on Human Health and Safety	The proposed action has the greatest potential of successfully reducing this risk	Threats could remain similar or could be greater than the proposed action.	Impacts on Human Safety could be greater under this alternative than the proposed action.	Depending on actions taken by the land manager, results could increase, decrease or remain the same.
Effects on Aesthetics	Variable. Land managers who are receiving damage would favor this alternative. Some activist would oppose this alternative.	Variable. Some people would favor this alternative, however, Landowners would probably impose their own lethal control, resulting in a larger take.	Since WS could not use non-lethal methods the impacts of this alternative would be greater than the proposed action. Some activist would oppose this alternative.	Airport personnel or government contractors would likely conduct similar WDM activities no longer conducted by WS, resulting in impact similar or greater to the current program alternative.
Humanness and Animal welfare	Some people will view as inhumane.	People who perceive the use of lethal	Impacts for this alternative would be	Airports would likely implement a similar

Concerns of Lethal methods Used by WS	Other will view as more humane than alternative 3. Most people would view AVAM approved euthanization methods as humane.	control methods by WS as inhumane would prefer this alternative to the proposed action.	similar to the proposed action.	WDM plan, and results would likely be similar or somewhat less humane with this alternative than under the proposed action.

Appendix A

Literature Cited

Andrews, J.A., B.T. Bennett, J.D. Clark, K.A. Houpt, P.J. Pascoe, G.W. Robinson, and J.R. Boyce. 1993. 1993 Report of the AVMA Panel on Euthanasia. J. American Veterinary Medical Association 202:(2):229-249.

AVMA (American Veterinary Medical Association). 1987. Journal of the American Veterinary Medical Association. Panel Report on the Colloquim on Recognition and Alleviation of Animal Pain an Distress. 191:1186-1189.

Arhart, D.K. 1972. Some factors that influence the response of starlings to aversive visual stimuli. M.S. Thesis. Oregon State University Corvallis.

Avery, M.L., J.S. Humphrey, and D.G. Decker. 1997. Feeding deterrence of anthraquinone, anthracene, and anthrone to rice-eating birds. J. Wildl. Manage. 61(4):1359-1365.

Berryman, J. H. 1991. Animal damage management: responsibilities or various agencies and the need for coordination and support. Proc. East. Wildl. Damage Control Conf. 5:12-14.

Besser, J.F., W. C. Royal, and J. W. DeGrazio. 1967. Baiting starlings with DRC-1339 at a cattle feedlot. J. Wildl. Manage. 3:48-51.

Blanton, E. M., B. U. Constantin, and G. L. Williams. 1992. Efficacy and methodology of urban pigeon control with DRC-1339. Proc. East. Wildl. Damage Cont. Conf. 5:58-62.

Bomford, M. 1990. Ineffectiveness of a sonic device for deterring starlings. Wild. Soc. Bull. 18:(2):151-156.

Bookhout, T.A. and S.B. White. 1981. Blackbird and Starling roosting dynamics: implications for animal damage control. Proc. Bird Control Semin. 8:215-221.

CDFG (California Department of Fish and Game). 1991. California department of fish and game. Final environmental document - bear hunting. Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, State of California, April 25, 1991. 13pp.

Clark, L. 1997. Dermal contact repellents for starlings: foot exposure to natural plant products. J. Wildl. Manage. 61(4): 1352-1358.

Code of Federal Regulations (CFR). 1995. Chapter 1 Wildlife and Fisheries. Part 21 Subpart D. P371. Office of the Federal Register. U.S. Government Printing Office. Washington D.C.

Conover, M. R. 1982. Evaluation of behavioral techniques to reduce wildlife damage. Proc. Wildl.-Livestock Relation. Sym. 10:332-344.

Cunningham, D.J., E.W. Schafer, and L.K. McConnell. 1981. DRC-1339 and DRC-2698 residues in starlings: preliminary evaluation of their effects on secondary hazard potential. Proc. Bird Control Semin. 8:31-37.

Decino, T.J., D.J. Cunningham, and E.W. Schafer. 1966. Toxicity of DRC-1339 to starlings. J. Wildl.\ Manage. 30(2):249-253.

.

Dolbeer, R.A., J.L. Belant, and L. Clark. 1993. Methyl anthranilate formulations to repel birds form water at airports and food at landfills. Proc. Great Plains Wildl. Damage Contr. Workshop. 11:42-52.

Dolbeer, R.A., C.R. Ingram, and J.L. Seubert. 1976. Modeling as a management tool for assessing the

impact of blackbird control measures. Proc. Vertebr. Pest Conf. 7:35-45.

_____ and R. A. Stehn. 1979. Population trends of blackbirds and starlings in North America, 1966-1976. U.S. Fish Wild. Serv. Spec. Sci. Rep. 214.

_____ , L. Clark, P.P. Woronecki, and T.W. Seamans. 1992. Pen tests of methyl anthranilate as a bird repellent in water. Proc. East. Wildl. Damage Control Conf. 5:112-116.

_____, P.P. Woronecki, and R.L. Bruggers. 1986. Reflecting tapes repel blackbirds from millet, sunflowers, and sweet corn. Wildl. Soc. Bull. 14:418-425.

_____, T.W. Seamans, B.F. Blackwell, J.L. Belant. 1998. Anthraquinone formulation (Flight Control) shows promise as avian feeding repellent. J. Wildl. Manage. 62(4)1558-1564.

EPA (U.S. Environmental Protection Agency). 1995. R.E.D. Facts _ Starlicide (3-chloro-p-toluidine hydrochloride). USEPA, Prevention, Pesticides and Toxic Substances. EPA-738-F-96-003. 4 p.

EPA (U.S. Environmental Protection Agency). 1997. 4-Aminopyridine. Health Assessment Information. Taken from USEPA IRIS data file No. 504-24-5 (03/01/97) at Internet site http://www.epa.gov/ngispgm3/irisdat/0440.DAT

ETOXNET (Extension Toxicology Network). 1996. 4-Aminopyridine. Pesticide Information Profiles. Coop. Ext. Offices at Cornell Univ., OR State Univ., Univ. of ID, Univ. of CA-Davis, and the Instit. for Envir. Toxicology, MI State Univ. Information taken from Internet site http://ace.ace.orst.edu/info/extoxnet/pips/4-aminop.htm.

Feare, C., A.J. Isaacson, P.A. Sheppard, and J.M. Hogan. 1981. Attempts to reduce starling damage at dairy farms. Protection Ecol. 3(2):173-181.

Feare, C. 1984. The Starling. Oxford University Press. Oxford New York.

Fuller-Perrine, L.D. and M.E. Tobin. 1993. A method for applying and removing bird exclusion netting in commercial vineyards. Wildl. Soc. Bull. 21:47-51.

Glahn, J.F. 1982. Use of starlicide to reduce starling damage at livestock feeding operations. Proc. Great Plains Wildl. Damage Control Workshop. 5:273-277.

_____, S.K. Timbrook, and D.J. Twedt. 1987. Temporal use patterns of wintering starlings at a southeastern livestock farm: implications for damage control. Proc. East. Wildl. Damage Control Conf. 3:194-203.

_____., and E. A. Wilson. 1992. Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. Proc. East. Wildl. Damage Cont. Conf. 5:117-123.

Graves, G. E., and W. F. Andelt. 1987. Prevention and control of woodpecker damage. Service in Action, Colo. St. Univ. Coop. Ex. Serv. Publ. no 6.516. Ft. Collins, Colo. 2 pp.

Hines, J., S. Schwartz, B. Peterjohn, J.R. Sauer. 1996. The North American Breeding Bird Survey. (Information retrieved from Internet World-wide Web site http://www.im.nbs.gov/bbs/bbs.html.)

Hygnstrom, S. E., and S. R. Craven. 1994. Hawks and owls. pp. E53-62 in Prevention and control of wildlife damage. S. Hygnstrom, R. Timm, and G. Larson eds. Coop. Ext. Serv. Univ. of Nebr.-Lincoln

Heusmann, H.W., and R. Bellville. 1978. Effects of nest removal on starling populations. Wilson Bull. 90(2):287-290.

Johnson, R.J., and J.F. Glahn. 1994. European Starlings. p. E-109 - E-120 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Leopold, A. S. 1933. Game Management. Charles Scribner & Sons. NY, NY. 481 p.

McCracken H.F. 1972. Starling control in Sonoma County. Proc. Vertebr. Pest Conf. 5:124-126.

Mason, J.R.,, A. H. Arzt, and R.F. Reidinger. 1984. Evaluation of dimethylanthranilate as a nontoxic starling repellent for feedlot settings. Proc. East. Wildl. Damage Control Conf. 1:259-263.

_____, M.A. Adams, and L. Clark. 1989. Anthranilate repellency to starlings: chemical correlates and sensory perception. J. Wildl. Manage. 53:55-64.

Meanley, B. and W. C. Royall. 1976. Nationwide estimates of blackbirds and starlings. Proc. Bird Control Seminar. 7:39-40.

Miller, J.W. 1975. Much ado about starlings. Nat. Hist. 84(7):38-45

Missouri Department of Conservation. 2000 Wildlife Code of Missouri p.19 Owner May Protect Property

_____, 2000 Unit 19 Deer Population Data

_____, 2000 MDC web page, State Deer History and Population

_____, 2000 MDC web page, Missouri Waterfowl Status, 2000

_____, 2000 MDC Ziehmer, : Letter of Concurance:

Mott. D.F. 1985. Dispersing blackbird-starling roosts with helium-filled balloons. Proc. East. Wildl. Damage Conf. 2:156-162.

Pochop, P.A. 1998. Comparison of white mineral oil and corn oil to reduce hatchability of ring-billed gull eggs. Proc. Vertebr. Pest Conf. 18:411-413.

_____, J.L. Cummings, J.E. Steuber, and C.A. Yoder. 1998. Effectiveness of several oils to reduce hatchability of chicken eggs. J. Wildl. Manage. 62(1):395-398.

RJ Advantage, Inc. 1997.

Rossbach, R. 1975. Further experiences with the electroacoustic method of driving starlings from their sleeping areas. Emberiza 2(3):176-179.

Royall, W. C. 1977. Blackbird-Starling Roost Survey. Bird Damage Research Report #52. Denver Wildlife Research Center. 54pp.

Royall, W. C. , T.J. DeCino, and J.F. Besser. 1967. Reduction of a Starling Population at a Turkey Farm. Poultry Science. Vol. XLVI No. 6. pp 1494-1495.

Sauer, J. R., J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn. 1997. The North American Breeding Bird

Survey Results and Analysis. Version 96.4. Patuxent Wildlife Research Center, Laurel, MD (Information retrieved from Internet World-Wide Web site http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Sauer, J. R., J. E. Hines, I. Thomas, J. Fallon, and G. Gough. 1999. *The North American Breeding Bird Survey, Results and Analysis 1966 - 1998. Version 98.1, USGS Patuxent Wildlife Research Center, Laurel, MD*

Sauer, J. R., J. E. Hines, I. Thomas, J. Fallon, and G. Gough. 2000. *The North American Breeding Bird Survey, Results and Analysis 1966 - 1999. Version 98.1, USGS Patuxent Wildlife Research Center, Laurel, MD*

Sauer, J. R., J. E. Hines, I. Thomas, J. Fallon, and G. Gough. 2000. *The North American Breeding Bird Survey, Results and Analysis 1980 - 1999. Version 98.1, USGS Patuxent Wildlife Research Center, Laurel, MD*

Schmidt, R. H. 1989. Animal welfare and wildlife management. Trans. N. A. Wildl. And Nat. Res. Conf. 54:468-475

Schmidt, R.H. and R.J. Johnson. 1984. Bird dispersal recordings: an overview. ASTM STP 817. 4:43-65.

Shirota, Y.M. and S. Masake. 1983. Eyespotted balloons are a device to scare gray starlings. Appl. Ent. Zool. 18:545-549.

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. A. Wildl. Nat. Res. Conf 57:51-62.

Twedt, D.J., and J.F. Glahn. 1982. Reducing starling depredations at livestock feeding operations through changes in management practices. Proc. Vertebr. Pest Conf. 10:159-163.

Tobin, M. E., P. P. Woronecki, R. A. Dolbeer, R. L. Bruggers. 1988. Reflecting tape fails to protect ripening blueberries from bird damage. Wildl. Soc. Bull. 16:300-303

USAF (U.S. Air Force), BASH web site 2000. www-afsc.saia.af.mil

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) Strategic Plan. 1989. USDA, APHIS, ADC Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737

USDA (U.S. Department of Agriculture), 1997 (revised) Animal Damage Control Program Final Environmental Impact Statement. Vol 1-3. Animal and Plant Health Inspection Service, 4700 River Road, Unit 87, Riverdale, MD 20737

USDA-Wildlife Services Managing Wildlife Hazards at Airports, July 1998

USFWS (Werner) February 2001 Section 7 Letter of Concurance.

West, R.R., J.F. Besser and J.W. DeGrazio. 1967. Starling control in livestock feeding areas. Proc. Vertebr. Pest Conf. San Francisco, CA.

West, R.R. and J.F. Besser. 1976. Selection of toxic poultry pellets from cattle rations by starlings. Proc. Bird Control Semin. 7:242-244.

Williams, D.E. and R.M. Corrigan. 1994. Pigeons (Rock Doves) p. E-87 - E-96 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Wildlife Society, The. 1990. Conservation policies of the Wildlife Society. The Wildlife Society. Wash., D.C. 20 p.

Woronecki, P. P., R. A. Dolbeer, and T. W. Seamans. 1990. Use of alpha-chloralose to remove waterfowl from nuisance and damage situations. Proc. Vertbr. Pest Conf. 14:343-349.

Wright, E.N. 1973. Experiments to control starling damage at intensive animal husbandry units. Bull. OEPP. 9:85-89.

Appendix B

WILDLIFE DAMAGE MANAGEMENT (WDM) METHODS AVAILABLE FOR USE OR RECOMMENDATIONS BY THE MISSOURI WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS-NONCHEMICAL

Airfield management and property owner practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Airfield management or the property owner implements cultural methods and other management techniques. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practically. These methods include:

> **Cultural methods.** These may include altering the flight times of departing and arrival times so that flying is at a time period of low wildlife activity. Restricting flying during Bird Watch Conditions (BWC) is Moderate or Severe can reduce threats to flying operations. Restrictions are outline in 91-15 (BW Plan).
>
> **Environmental/Habitat modification** can be an integral part of WDM. Wildlife production and/or presence are directly related to the type, quality and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain wildlife species. Airports are responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of WDM strategies at or near airports to reduce BASH problems by eliminating nesting, denning, roosting, loafing and feeding sites. Generally, many BASH problems on airport properties can be minimized through management of vegetation and water on areas adjacent to aircraft runways.

Animal Behavior Modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve us of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods are included in this category are:

- Wildlife fence (Physical Exclusion)
- Bird-proof barriers
- Propane cannons
- Pryotechnics
- Distress Calls and sound producing devices
- Chemical frightening agents
- Repellents
- Harassment with a radio controlled plane
- Mylar tape

These methods are generally only practical for small area. Scaring devices such as distress calls, propane cannons, raptor effigies and silhouettes, mirrors and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota et al. 1983, Conover 1982, Arhart 1972).

Wildlife Fence (Physical Exclusion) – A fence around the airfield could limit the entry of mammals onto the runway and taxiways. There are several types of fences that inhibit the movement of mammals onto the airfield area if properly installed including electric fencing, woven wire, and chain link fencing.

Bird-proof barriers can be effective but often are cost-prohibitive, particularly because of the aerial mobility of, which requires overhead barriers as well as peripheral fencing or netting. Building, hangers and display planes could be "bird proofed" using hardware cloth or netting, where feasible, to eliminate roosting and nesting areas. Porcupine wire (e.g., Nixalite™, Catclaw™) is a mechanical repellent method that can be used to exclude pigeons and other bird from ledges and other roosting surfaces (Williams and Coorigan 1994). The sharp points inflict temporary discomfort on the birds as they try to land, which deters them from roosting. Drawbacks of this method are that some pigeons have been know to build nests on top of porcupine wires and the method can be expensive to implement if large areas are involved. Electric shock bird control systems are available from commercial sources and, although expensive, can be effective in deterring pigeons and other birds from roosting on ledges, window sills and other similar portions of structures (Williams and Corrigan 1994).

Auditory scaring devices such as propane cannons, pyrotechnics, electronic guards, sirens, scarecrows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Mott 1985, Shirota et.al. 1983, and Arhart 1972). These methods should be reinforced with other scaring devices such as shooting and other types of physical harassment.

Visual techniques such as use of mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly gives birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et.al 1986, and Tobin et.al. 1998). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Physical harassment by radio controlled airplanes are effective in several situations for dispersing damage-causing birds. This tool is effective in removing raptors from areas that are not accessible by other means. Radio controlled airplanes allow for up close and personal harassment of birds, while combining visual (eyespots painted on the wings) and auditory (engine noise and whistles attached to the aircraft) scare devices. Disadvantages of method are birds in large flocks do not respond to well the plane, training is required to become efficient, a good working relationship is required by the operator and air traffic controllers, weather conditions may restrict the ability/usefulness of the plane, and mechanical up keep.

Relocation of damaging birds to other areas following live capture generally would not be effective nor cost-effective. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions to the rule for relocating birds. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as migratory waterfowl, raptors, or T&E species. In these cases, WS would consult with the USFWS and/or MDC to coordinate capture, transportation, and selection of suitable relocation sites.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Egg addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways,

but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see *Egg oiling* below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has shown to be effective.

Live traps include:

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS' standard procedure when conducting pigeon trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked daily, every other day, or as appropriate, to replenish bait and water and to remove captured birds.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Mist nets are more commonly used for capturing small-sized birds such as house sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping "pockets" in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture.

Pole traps are small leg hold traps used for capturing birds of prey such as hawks and owls. A padded leg hold trap is mounted atop of a perch-pole. When the trap is triggered, the captured bird rests on the ground until removed.

Swedish Goshawk traps are large cage type traps used for catching large birds of prey such as hawks and owls. These traps are two part traps with live bait (pigeons, rabbits, or starlings) placed in the lower section. The birds of prey are captured, when then investigate the prey and perch on the trigger bar causing them to fall into the upper portions of the trap which closes around the bird.

Bal-chatri traps are small traps used for capturing birds of prey such as hawks and owls. Live bait such as pigeons, starlings, rodents, etc. are used to lure raptors into landing on the trap (Hygnstrom and Craven 1994) where nylon nooses entangle their feet and hold the bird. The trap is made of chicken wire or other wire mesh material which is formed into a Quonset hut-shaped cage that holds the live bait. The outside top and sides are covered with many nooses consisting of strong monofilament line or stiff nylon string.

Leghold traps are small traps that come in a variety of sizes that allows the traps to be species of some degree. These traps are used for both mammals and birds and can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws which hold the animal.

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the snare the loop becomes smaller in size, holding the animal as if it were on a leash. Many snare are equipped with integrated stops that permit snaring, but do not choke the animal.

Bow nets are small circular net traps used for capturing birds and small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord.

Hand nets are used to catch birds and small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles.

Net guns are devices used to trap birds and mammals. The devices project a net over at target using a specialized gun.

NONLETHAL METHODS - CHEMICAL

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl (Dolbeer et al. 1993). Methyl anthranilate (MA) is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et.al. 1984; 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[3]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[4]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb. with retreating required every 3-4 weeks (RJ Advantage, Inc. 1997). An example of the level of expense involved is a golf course in Rio Rancho, NM where it was estimated that treating four watercourse areas would cost in excess of $25,000 per treatment for material alone. Cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water (RJ Advantage, Inc. 1997) which indicates the repellent effect is short-lived.

Another potentially more cost effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site (Dr. P. Vogt, RJ Advantage, Inc., pers. comm. 1997). Applied at a rate of about .25 lb./ acre of water surface, the cost is considerably less than when using the turf or water treatment

[3]An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

[4]An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

methods. However, the fogging method is currently not registered for use in Missouri and therefore cannot legally by used to meet the goals of the proposed action.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by U.S. Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA).

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, starlings rejected grain to which charcoal particles were adhered (L. Clark, National Wildlife Research Center, pers. comm. 1999). If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, pers. comm. 1999).

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). This chemical is not yet registered in the U.S. but may become available at some future date. Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting starlings (Clark 1997). Napthalene (moth balls) was found to be ineffective in repelling starlings (Dolbeer et al. 1988).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellancy of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

.

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Pre-baiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding and usually a few birds will consume a treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Bio-degradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. A

formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997, Appendix P).

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1994) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bio-accumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, nontarget species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

LETHAL METHODS - MECHANICAL

Conibear (Body Gripping) Traps are the steel framed traps used to capture and quickly kill aquatic mammals. These traps come in a variety of sizes and may be used on land or in the water depending on size and state and local laws. The traps are made of two steel square frames that are hinged on two sides and have one or two springs.

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally shooting is conducted with shotguns or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire firearms is sometimes used to manage bird and mammal damage problems when lethal methods are determined to be appropriate. The birds and animals are killed as quickly and humanely as possible. WS follows all firearm safety precautions when conducting WDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Shooting is also a very effective method that can be used in the management of damage

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

WS sometimes recommends sport hunting as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the Missouri Department of Conservation (MDC) and USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for pigeon damage management White-tailed deer, Canada geese, and other damage causing waterfowl.

Snap traps are modified rat snap traps used to remove individual woodpeckers, starlings, and other cavity use birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area caused by the woodpecker. These traps pose no imminent danger to pets or the public.

Cervical Dislocation - is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (Andrews et al. 1993). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Andrews et al. 1993).

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (administered by the EPA and the Missouri Department of Natural Resources (MO DNR) or by the FDA. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by MO DNR and are required to adhere to all certification requirements set forth in FIFRA and Missouri pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Egg oiling is method of suppressing reproduction of nuisance birds by spraying a small quantity of food grade corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability. (Pochop 1998; Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not renest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

DRC-1339 is the principal chemical method that would be used for starling/blackbird and pigeon damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds, and mammals. For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as nonsensitive. Numerous studies show

that DRC-1339 poses minimal risk of primary poisoning to nontarget and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). Appendix P of USDA (1994) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

DRC 1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the BDM project

Zinc-Phosphide, is used to reduce rodent populations to assist in the management of predators. Zinc-phosphide at concentrations of 0.75% to 2.0% on grain, fruit, or vegetable baits, has been used successfully against such species as meadow mice, ground squirrels, prairie dogs, Norway rats, Polynesian rats, cotton rats and nutria. Zinc-phosphide is a heavy, finely ground gray-black powder that is partially insoluble in water and alcohol. When exposed to moisture, it decomposes slowly and releases phosphine gas (PH3) Phosphine, which s highly flammable, may be generated rapidly if the material comes in contact with dilute acids. Zinc-phosphide concentrate is a stable material when kept dry and hermetically sealed.

Although zinc phosphate baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. For many uses of zinc phosphate formulated on grain or grain-based baits, pre-baiting is recommended or necessary for achieving good bait acceptance.

When zinc phosphate comes into contact with dilute acids in the stomach, phosphate (PH3) is released. It is this substance that probably caused death. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication that occurs is similar to intoxication with yellow phosphorous, in which the liver is heavily damaged. Prolonged exposure to phosphine can produce chronic phosphorous poisoning.

Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is no secondary poisoning with this rodenticide. The bait however, remains toxic up to several days in the gut of the dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.

Appendix C

List of Consulting People, Reviewer and Prepares

Todd C. Stewart, USDA-APHIS-WS, Wildlife Biologist
David Reinhold, USDA-APHIS-WS, Eastern Region NEPA Coordinator
Ed Hartin, USDA-APHIS-WS, Missouri State Director
David Hamilton, Missouri Department of Conservation, Furbearer Biologist
Lonnie Hansen, Missouri Department of Conservation, White-tailed Deer Biologist
Jeff Berringer, Missouri Department of Conservation
Rick Hansen, United States Fish and Wildlife Service, Columbia, MO
Andy Roberts, United States Fish and Wildlife Service, Columbia, MO
Kelly Srigley Werner, United States Fish and Wildlife Service, Columbia, MO
Eugene LeBouf, USAF BASH Manager, Kirtland Air Force Base
Sandy Wright, USDA-NWRC, Sandusky, Ohio